

## Step 5 - Interpretation

### Introduction

This step compares existing, historical, and reference conditions of specific landscape elements, and explains significant differences, similarities or trends, and their causes. Issue-specific desired conditions based on Forest Plan guidance and landscape characteristics are discussed.

This chapter begins with a brief outline of planning direction as it applies to the Lower Scott analysis area. A brief overview of management areas and their corresponding goals and objectives is Included with the planning direction. Answers to the Step 5 key questions by issue, as outlined in Step 2, follow the management area overviews.

### Planning Direction

The planning direction for determining desired conditions is derived from all appropriate laws and administrative direction, including the Record of Decision of the Northwest Forest Plan (ROD). The ROD provides standards and guidelines for management of habitat for late successional and old-growth forest related species within the range of the northern spotted owl. The ROD establishes a system of Late-Successional Reserves (LSRs) to provide habitat and connectivity for late-seral dependent wildlife species. The ROD also establishes the Aquatic Conservation Strategy (ACS) to restore and maintain the ecological health of watersheds and aquatic ecosystems. The ACS includes establishment and management of Riparian Reserves and Key Watersheds, completion of Watershed Analyses, and watershed restoration. The Forest Plan incorporates the ROD and Aquatic Conservation Strategy. The Forest Plan identifies land allocations, desired conditions, and standards and guidelines for the National Forest lands. This analysis incorporates and relies on the Forest Plan. A brief summary of Forest Plan land allocations applicable to the Lower Scott Analysis Area follows to provide a basis for the desired conditions presented by issue later in this chapter.

National Forest lands in the analysis area are divided into nine Forest Plan management areas; Wilderness, Late-Successional Reserve (LSR), Sensitive Species, Riparian Reserve, Scenic River Visual Quality Objective (VQO), Retention VQO, Recreational River, Partial Retention VQO, and General Forest. Figure 1-2 LMP Management Areas, contained in the Map Packet at the end of this document, shows the distribution and Table 5-1

Management Area Acreage, displays acreage of each area and percent National Forest Lands.

**Table 5-1. Management Area Acreage.**

Management Area	Acreage 1/	% NF Lands
Wilderness	19,763	26
Late-Successional Reserve	20,725	28
Sensitive Species	352	<1
Riparian Reserve	9,550	13
Scenic River	1,205	2
Retention VQO	922	1
Recreational River	1,674	2
Partial Retention VQO	16,487	22
General Forest	4,059	5
<b>TOTAL</b>	<b>74,738</b>	<b>99</b>

1/ The reported acreage contains updates of land allocation estimates from the *Forest Plan*, particularly Riparian Reserve; and does not include the 22,942 acres of private lands in the analysis area.

### Wilderness

The Marble Mountain Wilderness encompasses a large portion (26%) of the Lower Scott analysis area. Wilderness areas are to be managed for wilderness characteristics, natural conditions, and ecological processes. They are to provide primitive or semi-primitive, non-motorized recreational opportunities. Lightning caused fires are to be treated as prescribed natural fires provided they meet management objectives; otherwise, they will be treated as wildfires and suppressed with minimum impact suppression techniques. Wilderness management objectives have not been completed for the Marble Mountain Wilderness and most lightning fires are suppressed. A fire plan is needed to define objectives and prescriptions for prescribed natural fire. Management ignited fires are permitted to allow fire to return to a more natural role, although planned ignitions in wilderness have not been attempted on the Klamath National Forest.

### Late-Successional Reserves (LSRs) and Sensitive Species

Portions of the Seiad and Collins Baldy LSRs are within the analysis area. These two LSRs along with 100 acre LSRs are the largest land allocation within the analysis area (28%) and include lands in the upper portion of Tompkins Creek, Townsend Gulch, McCarthy Creek, Middle Creek, the upper portion of Mill Creek, and tributaries to upper Mill Creek. Several 100-acre LSRs are located in the area between these large LSRs. The goal of late-successional reserves and sensitive species areas is to provide habitat for late-seral dependent wildlife and other terrestrial T&E species over the long-term.

---

## Riparian Reserves

---

Riparian Reserves are for the protection of aquatic dependent species and to provide late-seral connectivity between LSRs. Riparian Reserve acreage is approximated for this analysis as described in Step 3 and Step 5 Riparian Reserves. The value in Table 5-1 includes only National Forest lands outside Wilderness, LSR, Special Habitat, or Special Management Areas. Riparian Reserve boundaries on the ground are to be determined by project and may vary from mapping done for this analysis. Riparian Reserve Standards and Guidelines apply on any National Forest land, within and outside Wilderness, LSR, and Special Management areas, but do not apply on private lands.

---

## Scenic and Recreational River

---

The lower Scott River is a designated National Wild and Scenic River. The boundaries of the Wild and Scenic River corridor have been established. In the Scenic River management area, the goal is to preserve the scenic qualities in a free-flowing condition. Provide recreational use that will not cause adverse impacts to the remarkable values of the river area. In the Recreational River management area, timber harvest is allowed but should meet Partial Retention VQO. Timber output expectations are the same as for Partial Retention.

---

## Retention, Partial Retention, and General Forest

---

The Retention VQO, Partial Retention VQO, and General Forest management areas have timber harvest expectations and scheduled yields. The primary difference is the visual quality objectives. Retention VQO provides attractive scenery by maintaining natural or natural appearing conditions. The expectation for timber output is low, about five percent of standing volume per decade, because of the visual considerations. Partial Retention is intended to provide an attractive landscape where management activities remain visually subordinate to the natural character of the landscape. General Forest areas have less restrictive VQOs of either modification and maximum modification. Timber outputs are considered moderate for the Partial Retention and General Forest areas, approximately 16% of the standing timber volume harvested per decade.

---

## Areas Masked By Other Management Areas

---

**Research Natural Areas (RNA) and Special Interest Areas (SIA):** The analysis area contains one RNA and borders one SIA. The Marble Caves RNA was established to gain knowledge and information from non-manipulative research, monitoring and educational

activities. The Lake Mountain Foxtail Pine SIA was established to highlight the botanical values of the northern most location of foxtail pine. SIA's are sites designated for recreation experiences where education and interpretation of unique or special natural resource values are emphasized. These areas do not show on Figure 1-2 because they are masked by Wilderness and LSR (refer to Figure 6-5 for RNA and SIA locations).

**Critical Habitat Units (CHUs) and Released Roadless Areas** are also found in the analysis area. The Fish and Wildlife Service established critical Habitat Units for long-term protection of habitat for the northern spotted owl. Most of the CHU areas have been incorporated into Late-Successional Reserves but small portions extend outside of LSRs. Designation as a CHU will not likely impact the management of LSRs and Riparian Reserves but may have implications in other management areas. Management implications of CHUs will be discussed in more detail under the Terrestrial Wildlife issue.

Released Roadless Areas were unroaded (RARE II) areas released for multiple use management under the *California Wilderness Act*. Some of these areas have since become roaded, 6,496 acres in this analysis area, but are retained in the database as released roadless. Controversy concerning entry into roadless areas affects management of these areas. Released roadless designation has some present impacts on those management areas available for scheduled timber harvest and may affect management in LSRs and Riparian Reserves as well. The management implications of Released Roadless Areas will be discussed in more detail under the Commercial Timber Harvest Outputs on Public Lands issue. The acreage of Released Roadless Areas is displayed for each management area in Table 5-2 Released Roadless Areas.

**Table 5-2. Released Roadless Areas.**

Management Area	Released Roadless Area Acreage 1/	Released Roadless Area That Have Been Roaded (Acres)	Released Roadless Area That Are Still Roadless (Acres)
LSRs	2,065	1,513	552
Sensitive Species	208	23	185
Riparian Reserve	1560	1,262	298
Retention VQO	84	0	84
Recreational River	58	0	58
Partial Retention VQO	3,135	2,537	598
General Forest	1,443	1,161	282
<b>TOTAL</b>	<b>8,553</b>	<b>6,496</b>	<b>2,057</b>

---

## Aquatics

---

## Hillslope Processes

---

---

---

**Key Question #1a - What changes are there between current and reference/historical runoff and erosion rates and what causes these changes?**

---

---

Changes between reference/historic and current watershed conditions are best described in general, qualitative terms, as little quantitative data exists before thirty to forty years ago. It is assumed that watershed impacts were, and are, proportional to amounts of ground-disturbing activities. Beginning in the late 1800s and through the 1900s humans modified the Lower Scott landscape with mining, roads, timber harvest units, and recreation facilities. The ecological regime was also modified by fire suppression, which changed the character of the vegetation.

The only way to estimate watershed conditions in the past is through older aerial photographs and geologic investigations. Pre-historically, natural landslides and floods occurred primarily in response to severe rainstorms. It is assumed then, based on hillslope conditions, that the pre-historic rate of sediment production was much less than the modern rate. This interpretation is based on several assumptions: 1) prior to the construction of Forest Service and County roads, sediment was not generated from road surface erosion, fill-failures, and road stream crossings; 2) prior to suppression of wildfire, fires burned with less intensity, resulting in fewer post-fire landslides and erosion problems; and 3) prior to timber harvest, sediment was not generated from surface erosion or landslides in harvest units.

Early mining had an intense effect on channel and hillslope conditions. Intense mining activity occurred all along the lower four miles of the Scott Bar from the 1850s to the early 1900s. Both lode and placer claims were worked including hydraulic operations and extensive dredging. At times wing-dams diverted the entire flow of the Scott River. Large volumes of timber were cut to supply wood for the mines. Historic photos show the slope above Scott Bar completely denuded of timber. In addition, several large rainstorms occurred in the late 1800s. These storms were probably equivalent to, or slightly larger than the December 1964 flood.

The effect on hillslope condition was probably less severe than it was on channel condition. The slopes that were timber harvested have largely regenerated; however, most hydraulic pits remain devoid of vegetation today.

Extensive development of Forestlands for timber harvest did not occur until the early 1960s. New roads were constructed into previously undeveloped areas and the first timber sales with large clearcuts were harvested. Shortly afterwards, the great flood of December 1964 occurred. Many of the roads were built to a highway standard that did not allow water to disperse off the road surface, and many large clearcut areas had just recently been harvested

or burned. The 1964 storms had a severe damaging effect on these roads and harvest units. The resulting debris flows also severely impacted major stream channels. Much of the Canyon Creek, Kelsey Creek, Middle Creek, and Tompkins Creek areas were roaded and harvested during this time. In many areas, the effects of the 1964 flood are still apparent on both hillslope processes and channel conditions.

The flood of 1997 also had a significant effect on hillslope processes. The most intense effects occurred in a band in the 4500 to 6000 feet elevation zone along the north edge of the Marble Mountains, from Kelsey Creek to Grider Creek. It is presumed that localized rainfall was greatest in this zone. Previously, within this area, 1987 wildfires produced an area of high burn intensity in the headwaters of Deep and Tompkins Creeks. The 1997 flood created intensive landsliding on the steeper, roaded slopes in these two sub-watersheds. These hill slopes are still destabilized and will require another twenty to thirty years to stabilize. Other areas in Lower Scott experienced more moderate damage with local road failures. Many of these sites have been repaired. These areas will heal more rapidly and may return to equilibrium within five to ten years.

---

---

**Key Question #1b - What are the hydrologic/erosional concerns in the analysis area and in each sub-watershed? What management strategies should be used or changed to improve watershed conditions?**

---

---

There are two important modes of sediment production: 1) chronic sediment production, the fine sediment produced from exposed soil surfaces during runoff-producing rainfall. Exposed surfaces can be natural, road surfaces, or the result of timber harvest or fire; and 2) episodic sediment production, the sediment produced under intense rainfall resulting from natural and management-related landslides.

Chronic sediment production occurs every year, when and where runoff occurs on recently disturbed soil. Runoff occurs when and where the precipitation rate (or melt rate in the case of snow) exceeds the infiltration rate of the soil. Soil particles detached by abrasion of dry soil, disturbance of saturated soil, and ripping are carried by overland flow. Some overland flow arrives at stream courses or drainage ditches leading to stream courses. Burned surfaces produce ash, fine organic material, and soil particles. Local areas may experience runoff-producing precipitation during summer thunderstorms, but most fine sediment is produced by runoff of wet-season storms. Once loose particles have been removed by early runoff, the rate of fine sediment production declines. Without continuous disturbance of soil surfaces, fine sediment production carried by runoff would decline noticeably.

Chronic fine sediment production is a concern where sediment charged stream waters infiltrate gravels in stream channels, depositing sediment in spawning gravels in slower flow areas. This process interferes with respiration of salmonid eggs in the streambed as well as other biological processes in other aquatic species

Road surfaces are the major controllable source of chronic sediment production. The primary management-related component of chronic sediment originates from erosion of abraded, dry road surfaces; ditch erosion and wet weather use and disturbance of roads. Chronic fine sediment production from roads is controllable by surfacing roads with aggregate and control of road use during the times that the road surface is susceptible to abrasion and wet-weather disturbance.

Episodic sediment production occurs less frequently, about 5% probability in a year (a twenty year event), with more intense rainfall (10 or more inches of rain in 10 or less days for mid-winter). Episodic sediment production may also occur under intense precipitation of summer thunderstorms. Natural and road-related landslides, road-associated fill and cut failures, and road/stream crossing failures are the common sources of episodic sediment production.

Natural landslides that contribute to episodic sediment production include large, active earth flow landslides of the dormant landslide and residual soil terrane and debris slides of shallow soil mantle that occur in all of the geomorphic terranes.

The primary management-related component of episodic sediment originates from road-associated landslides, road-associated fill and cut failures, and road/stream crossing failures. According to "The Flood of 1997: Klamath National Forest" (de la Fuente et al. 1998), 83% of flood damage sites resulting from the January, 1997 flood were the result of these three sources of episodic sediment.

Road-related landslides account for about 18% of road damage sites from the 1997 flood. Roads through, or immediately adjacent to, active landslides pose the greatest risk to large volumes of episodic sediment delivery. Areas of toe zone, inner gorge, and dissected granitics have high potential of producing road-related earthflows. Some landslides can be small in size and easily handled by routine road maintenance. However, most are significantly large failures that are difficult or financially unfeasible to repair. In some cases the failure is slow and not readily or immediately apparent.

Road fill failures account for about 14% of the road damage sites as reported in the flood damage study. Numerous failures of the road cut face and natural foundation of the fill are observed in unconsolidated inner gorges and toe zones. Many fill failures are called wash

outs or blowouts due to the erosive action of flowing water on poorly compacted fills. Fill failures can also result in mudflow landslides, which are often very destructive for a long distance down stream.

Most significantly, road/stream crossing failures account for about 51% of the road damage sites. In this count are all damage sites at stream crossings, regardless of cause, including culvert failures, landslides, and soil saturation. Many culverts were unable to pass the high volume of water and debris during the flood. Portions of roads and adjacent hill slopes were severely eroded, as culverts plugged or were overtopped. Streams were routed across or down roads and down slopes not capable of handling the large amount of flow.

Episodic sediment production of rare, intense storms produces large amounts of sediment to streams, resulting in significant changes in channel form, channel location, and disturbance of floodplain vegetation. Transport of such large influxes of sediment continues at an elevated rate for ten years after the original flood. During this time, the channel bed remains relatively unstable. Channel wandering and channel bank erosion occurs as flows find a way around deposits of coarse sediment. Movement of the unstable substrate can result in loss of developing fish eggs and sub gravel embryos.

Episodic sediment production is most effectively controlled by avoidance of construction in unstable terrane, site-specific mechanical stabilization measures, and control of drainage. There are only a few feasible opportunities to stabilize natural earth flow landslides, as most are too large and complex for reasonable fixes. There are, however, many opportunities to reduce the destabilizing effects of roads on earth flow landslides, toe zones, and stream crossings.

One of the best approaches to managing unstable ground, which are areas where large road-related earthflows are most likely to occur, is avoidance. High maintenance road segments in toe zone, unconsolidated inner gorge, and dissected granitics are good candidates for road decommissioning. Earthflows may continue to move, but suspending activities that keep the road open will often result in significant abatement of landslide processes. If a road on unstable terrane must be kept open, then road-aggravated damage by active earthflows can be reduced by minimizing the size of cuts and fills and avoiding disturbance of both surface and subsurface natural drainage patterns.

There are several techniques effective in preventing fill failure. Many local roads were constructed without controlled compaction. Achieving maximum compaction in construction of fills and repair of fill failures is key to preventing a subsequent failure at the same site. Soil moisture in the fill must be within a narrow range to

achieve optimum compaction. Well-compacted soil has fewer and smaller voids, so it absorbs less water and remains stronger when inundated. By controlling soil compactive effort and soil moisture the possibility of fill failure can be minimized. Increased soil density can significantly improve the stability of road fills. Mechanical reinforcement of fill (such as layered geotextile) and surface and subsurface drainage also serve to improve the strength of fills. This is an effective technique in situations where location of the road or soil properties makes good compaction difficult. Improvement in soil strength from good compaction, mechanical reinforcement, and drainage can prevent and/or reduce, damage by flowing water, such as by culvert failure.

In some cases structural repairs of fill failures, especially on unstable ground, toe zone, unconsolidated inner gorge, and dissected granitics, can be effective when a competent local foundation can be achieved. Foundation failures may be stabilized by over-excavating the foundation to competent material. Without achieving a competent foundation, repairs often won't survive subsequent flood events, failing in much the same way as before. Cut failures on unstable ground can often be stabilized with a drained reinforced earth buttress behind the cut. An inventory to identify low-density fills, fills constructed of cohesionless soil (decomposed granite) or other unsuitable material, and sites where surface or subsurface drainage threatens stability is needed to develop an effective watershed restoration program that reduces episodic sediment delivery.

There are also some techniques effective in reducing the risk of road/stream crossing failure. The standard design practice when most Forest roads were built included specifications for stream crossings to withstand 20 year floods. These crossings are at risk to fail during larger storm events. Construction and reconstruction now require stream crossings designed to withstand 100-year floods. To minimize impacts, road/stream crossings should be upgraded to pass water and debris during a 100-year or larger flood. Upsizing culverts is one way to achieve this. Another is to design crossings so, if culvert capacity is exceeded, water over-topping the road will cause minimal damage, erosion, and sediment delivery. An effective design may incorporate a culvert with rock-fill and a rolling dip to allow passage of water and debris over the road if necessary, while keeping the natural drainage channel in its original location. The site-specific road/stream crossing inventory should be utilized to determine sites most in need of upgrading. Drainage design is of key importance in reducing episodic sediment production at stream crossings.

A cumulative effects assessment is used to characterize the condition of a watershed. It is used to identify areas where, over time, the accumulation of management-related disturbances have reached a level where they inhibit or

prevent the proper functioning of a watershed, in particular its ability to absorb and respond to disturbance events, such as flood or wildfire. (Elder 1998)

An assessment of cumulative conditions in Lower Scott 7th field sub-watersheds was conducted to examine watershed conditions, processes, and functions. *Forest Plan* Cumulative Watershed Effects (CWE) components, using current Forest data layers and professional interpretation, were utilized. These models evaluate mass wasting, surface erosion, and Equivalent Roded Area (ERA) divided by a Threshold of Concern (TOC) and provide an index of existing conditions relative to disturbance and land sensitivity.

The Cumulative Effects Assessment also includes consideration of riparian area and stream conditions, land allocations for each sub-watershed, and other relevant site-specific information that cannot be included in watershed models. Riparian area and stream conditions are displayed under the Riparian Areas issue. Land allocations by sub-watershed were also considered in the recommendations. Land allocations for Lower Scott are displayed in Figure 1-2.

A description of the models used to assess cumulative conditions in Lower Scott follows.

The mass-wasting model is based on landslide rates quantified in the *Salmon Sub-Basin Sediment Analysis* (de la Fuente and Haessig 1993), methodology developed in Amaranthus, et al. (1985), the Grider EIS (1989), and the *Forest Plan*. Two landslide volumes are compared in this assessment. The first is a hypothetical background or reference condition, assuming the watershed is in pristine condition with no natural or management disturbances. The second is the current condition, modeled by overlaying timber harvest, road, and wildfire acres (displayed in Step 3, Table 3-1) with geomorphic terranes and multiplying by landsliding rates. Background sediment rates do not reflect actual historic condition, which would include the influence of fire (as discussed in Step 4), but does provide a consistent basis for comparison. Mass-wasting sediment production values, expressed as percent over background, appear in Table 5-3. In this assessment, sub-watersheds with mass wasting sediment production values exceeding 200% over background were classified as "over threshold" for this model. Although they provide a basis for comparison, modeled landslide volumes are estimates and should not be used as absolute values.

**Table 5-3. Sub-Watershed Mass Wasting Volumes.<sup>1</sup>**

Watershed Name	Background (Sediment/Year)	Total Sediment (Current Condition)	% Over Background <sup>2</sup>	Road %	Fire %	Timber Harvest %	Undisturbed %
Deep/Middle	2,156	8,091	275	47	17	14	22
Tompkins Creek	2,436	7,069	190	37	17	19	27
Upper Mill Creek	1,690	4,441	163	63	0	1	36
Lower Mill Creek	1,667	3,945	137	57	0	2	41
Boulder/Indian Scotty	2,532	5,382	113	53	0	3	45
Kelsey Creek.	3,452	7,273	111	19	23	17	41
BigFerry/McGuffy	2,457	5,004	104	52	0	0	48
Lower Canyon Creek	1,857	3,705	100	50	0	4	47
Townsend/ McCarthy	3,204	5,057	58	36	0	1	26
Franklin/Muck-a-Muck	2,230	3,229	45	32	0	0	68
Upper Canyon Creek	1,331	1,487	12	10	0	1	89
Red Rock Creek	1,156	1,156	0	0	0	0	100

<sup>1</sup> All landslide volumes are expressed as cubic yards per sub-watershed per year, based on a landslide-producing event or events with similar impacts to the floods of 1970-1974 (approximately equivalent to one 20 year flood).

<sup>2</sup> Percent over background is calculated by subtracting background sediment production from total sediment then dividing by background. For example, 100% over background is equivalent to two times (or 200% of) background.

Surface erosion is predicted using the Universal Soil Loss Equation (USLE). Roads are the primary disturbance influencing surface erosion model outputs. Site-specific conditions, such as road surfacing, are not used in this analysis due to modeling complexities and lack of data. In this assessment, sub-watersheds with surface erosion sediment production values exceeding 800% over background were classified as "over threshold" for this model.

Verification of USLE parameters, and therefore, surface erosion model outputs, is not as straightforward as the verification of landslide model parameters. Surface erosion model outputs can be highly variable depending on assumptions and should, like the landslide model outputs, be used as a comparative tool rather than an absolute measure. Surface erosion model outputs are shown in Table 5-4.

**Table 5-4. Sub-Watershed Surface Erosion Volumes.**

Watershed Name	Background Sediment	Total Sediment	% Over Background <sup>1</sup>	Road %	Timber Harvest %	Undisturbed %
Upper Mill Creek	47	416	791	89	0	11
Lower Mill Creek	53	352	567	85	0	15
Big Ferry/McGuffy	57	376	557	85	0	15
Tompkins Creek	109	711	553	77	10	13
Deep/Middle	88	529	500	78	7	15
Boulder/Indian Scotty	75	396	428	79	3	18
Lower Canyon Creek	63	315	398	78	3	19
Townsend/McCarthy	123	496	303	75	0	24
Franklin/Muck-a-Muck	75	213	184	65	0	35

Kelsey Creek	160	428	168	56	8	36
Upper Canyon Creek	67	80	20	16	1	83
Red Rock Creek	50	50	0	0	0	100
All surface erosion volumes are expressed as cubic yards per sub-watershed per year. 1/ Percent over background is calculated by subtracting background sediment production from total sediment then dividing by the background.						

The third modeling technique used in this assessment is the Equivalent Roaded Area (ERA) methodology. The ERA model provides a simplified accounting system for tracking disturbances that affect watershed processes. It estimates changes in peak run-off flows influenced by disturbance activities. This model, while not intended to be a process-based sediment model like the previous two models, does provide another indicator of watershed conditions. The methodology uses coefficients, which equate regeneration timber harvest and high and moderate intensity fire disturbances to an equivalent acre of road. These equivalent roaded acres are combined with actual roaded acres to calculate a total equivalent roaded acre disturbance. The amount of roads and regeneration harvest and fire are presented in Step 3, Table 3-3 for each sub-watershed in this analysis area. These are multiplied by coefficients presented in Appendix B Cumulative Watershed Effects. The sum of the disturbances (ERA) is divided by the area of each sub-watershed to arrive at a relative disturbance rating, percent ERA.

The percent ERA is then compared to a Threshold of Concern (TOC), or theoretical maximum disturbance level acceptable. The TOC is a measure of sub-watershed sensitivity. It is calculated based on beneficial uses, channel sensitivity, soil erodibility, hydrologic response, and slope stability for each sub-watershed. These factors are combined in a formula that determines the TOC (refer to **Appendix B**). In general, a lower TOC value indicates a greater chance of watershed impacts than a higher TOC value, given the same amount of watershed disturbance. The TOC is compared to the percent ERA for each sub-watershed.

The ERA/TOC, or risk ratio, estimates the level of hydrologic disturbance. It reflects relative risk of increased peak flows, potential for channel alteration, and general adverse watershed impacts. A percent ERA/TOC greater than 1.0 means that a watershed or sub-watershed has exceeded its natural capacity to "absorb" these disturbances, and is considered "over threshold" for this model. The ERA and TOC values for each sub-watershed are displayed in Table 5-5.

Table 5-5 Equivalent Roaded Area and Threshold Of Concern				
Watershed Name	Acres	% ERA	% TOC	Risk Ratio (ERA/TOC)

Tompkins Creek	9,321	7.0	7.0	1.00
Deep/Middle	8,204	6.1	8.0	0.76
Upper Mill Creek	7,217	3.6	7.5	0.48
Kelsey Creek	11,429	3.1	7.5	0.41
Lower Mill Creek	7,090	3.0	8.5	0.35
Boulder/Indian Scotty	8,688	2.9	9.0	0.32
Lower Canyon Creek	6,544	2.6	8.0	0.32
Big Ferry/McGuffy	7,636	2.6	9.0	0.29
Townsend/McCarthy	11,612	1.5	9.0	0.17
Franklin/Muck-a-Muck	6,447	0.9	9.0	0.10
Upper Canyon Creek	5,136	0.2	9.5	0.02
Red Rock Creek	4,124	0.0	0.0	0.00

This cumulative watershed effects assessment includes consideration of all three-model results individually and by using a combined index. The combined index models were weighted equally, with one-third to the ERA model and two-thirds to the two sediment production models. Model-derived sediment production (in cubic yards/acre/year) suggests that 75% of the total is from mass wasting and 25% from surface erosion. Therefore, the mass wasting model is weighted three times more than the surface erosion model. The final weighting for the three watershed models is 50% for the landslide model, 17% for the surface erosion model, and 33% for the ERA model. Results of the three models along with the combined index are shown in Table 5-6 Summary of Cumulative Watershed Effects Models.

**Table 5-6. Summary of Cumulative Watershed Effects Models.**

7 <sup>th</sup> Field Watershed	Area (Acres)	Mass Wasting (% Over)	Surface Erosion (% Over)	Risk Ratio (ERA/TOC)	Combined Index
Deep/Middle	8,204	275%	500%	0.76	1.05
Tompkins Creek	9,321	190%	553%	1.00	0.92
Upper Mill Creek	7,217	163%	791%	0.48	0.73
Lower Mill Creek	7,090	137%	567%	0.35	0.58
Boulder/Indian Scotty	8,688	113%	428%	0.32	0.48
Big Ferry/McGuffy	7,636	104%	557%	0.29	0.47
Kelsey Creek	11,429	111%	168%	0.41	0.45
Lower Canyon Creek	6,544	100%	398%	0.32	0.44
Townsend/McCarthy	11,612	58%	303%	0.17	0.26
Franklin/Muck-a-Muck	6,447	45%	184%	0.10	0.18
Upper Canyon Creek	5,136	12%	20%	0.02	0.04
Red Rock Creek	4,124	0%	0%	0.00	0.00

---

**Key Question 2- Which sub-watersheds have continued watershed concerns, when will they be considered recovered, and how can recovery be promoted and maintained?**

---

The Cumulative Watershed Effects models provide an index of existing conditions relative to disturbance and land sensitivity. These models along with riparian condition, stream condition, land allocations, and professional interpretation, were used to evaluate sub-watersheds in Lower Scott to determine areas that have continued watershed concerns or "impaired" watersheds. Professional interpretation was used to address anomalies or other significant factors influencing watershed condition not reflected by the models. Professional judgment was also used to establish thresholds. This process includes reviewing Areas With Watershed Concerns identified in the KLRMP (see Step 3, Hillslope Processes, Key Question 2).

Impaired sub-watersheds are places where levels of natural and human-caused disturbances have exceeded the ability of the area absorb and/or be resilient to additional disturbances. They are places where adverse Cumulative Watershed Effects are likely to occur. Impaired sub-watersheds express diminished beneficial uses (i.e. fish habitat, drinking water). Generally, impaired watersheds are measured using the Cumulative Effects Assessment; by the degree cumulative conditions exceed thresholds of concern. They are areas with high concentrations of roads, burned areas, and timber harvest units. Impairment is characterized by reduced resiliency to moderate-sized (10-year) disturbances. Impaired sub-watersheds are displayed in Figure 5-1.

Detailed information for each sub-watershed, including recommendations for future management, is contained in the following paragraphs. Impaired sub-watersheds are considered recovered when adverse cumulative watershed effects are no longer a concern.

**The Deep/Middle and Tompkins Creek Sub-Watersheds** are each over threshold in one of the watershed models. Deep/Middle exceeds the mass-wasting watershed model and has a combined CWE index of 1.05. Tompkins Creek exceeds the equivalent roaded area model and has a combined CWE index of 0.92. The primary reason for high watershed impacts in these two sub-watersheds is the combination of road density, timber harvest, and fire that occurred in the same areas. Each of these sub-watersheds have moderately high road densities, (2.65 miles per square mile in Deep/Middle, and 2.45 miles per square mile in Tompkins Creek), extensive past timber harvest, (18% for Deep/Middle, and 22% for Tompkins), and areas that burned with moderate and high fire intensity during the 1987 Kelsey fire, (10% for Deep/Middle, and 12% for Tompkins). In addition, the

steep, unstable lands in Deep and Tompkins Creeks make these watersheds less resilient to disturbance. Within the Deep/Middle sub-watershed boundary, Deep Creek and Middle Creek drainages have significantly different levels of impact. In Deep Creek the steep terrane, numerous landslides, and high disturbance levels are driving the impaired condition for the entire sub-watershed. Middle Creek is in better condition, and if it were to stand alone, would not be considered impaired. In impaired watersheds, activities that lead to recovery should consist of restoration (such as road decommissioning) or stand tending activities aimed at long-term watershed health. The plantations in these sub-watersheds may be in need of precommercial thinning, including those plantations in Riparian Reserves. Prescribed fire may be appropriate, especially in the previously burned areas, to protect these areas from future catastrophic wildfire.

**The Upper Mill, and Lower Mill Sub-Watersheds** are below threshold in all watershed models, but are approaching threshold in one or more model. The primary watershed impacts on Forest Service lands, for Upper Mill, and Lower Mill, are from roads. Road densities are high in each sub-watershed (4.1 and 3.6 miles per square mile) with some timber harvest on Forest Service lands, and extensive timber harvest on private lands within the checkerboard land ownership pattern. Forestlands within these sub-watersheds are now primarily designated Late Successional Reserve and are withdrawn from programmed timber harvest. Upper Mill Creek and Lower Mill Creek sub-watersheds should not be considered impaired, however future management actions should move modeled sediment production rates away from the thresholds they are approaching. Activities within these areas should include restoration (such as road improvements or road decommissioning) and stand tending to promote late-successional habitat, improve watershed health, and reduce the risk of future catastrophic wildfires.

**The Boulder/Indian Scotty, Kelsey Creek, and Lower Canyon Creek Sub-Watersheds** are below threshold in each watershed model. Road densities are low to moderate in each sub-watershed (1.0 to 2.7 miles per square mile). Each has some timber harvest disturbance (4% to 6%), and Kelsey Creek has 5% area that burned with moderate and high fire intensity during the 1987 Kelsey fire. Future activities may include additional disturbance (timber harvest) where appropriate, but should include watershed restoration to prevent them from becoming impaired. Prescribed fire may be appropriate to reduce risk of future catastrophic wildfire.

**The Big Ferry/McGuffy Sub-Watershed** is below threshold in each watershed model. The combine CWE index is 0.47. Road density is moderate (3.2 miles per square mile) with the majority of roads on private lands. The Big Ferry/McGuffy sub-watershed should not be

considered impaired. Activities should consist of restoration, where appropriate, to prevent this sub-watershed from becoming impaired, and other actions consistent with the land allocations and subject to project-level NEPA analysis.

**The Townsend/McCarthy, and Franklin/Muck-a-Muck Sub-Watersheds** are below threshold in each watershed model. Road densities are low, 1.2 to 1.7 miles per square mile. Combined indices are 0.26 and below. These sub-watersheds should not be considered impaired. The Franklin/Muck-a-Muck sub-watershed has dormant and active landslide terrane where road construction would be a concern. Activities should consist of restoration, where appropriate, and other actions consistent with the land allocations and subject to project-level NEPA analysis.

**The Upper Canyon Creek, and Red Rock Creek sub-watersheds** are both well below threshold in the models run for this analysis. Most of these two sub-watersheds are wilderness and road densities are very low (0.2 miles per square mile or less). These sub-watersheds should not be considered impaired. Activities should consist of those consistent with the land allocations and subject to project level NEPA analysis.

---



---

**Key Question #3a - What watershed processes are of concern with the current road system?**

**Key Question #3b - What are the criteria used to assess roads for the Access and Travel Analysis included in Appendix E of this document?**

---



---

The following factors were determined to be of concern in relation to watershed processes and the current road system: reducing accelerated sediment delivery from both mass wasting and surface erosion, reducing the alteration of hydrologic integrity, reducing road-related impacts to riparian reserve integrity, and giving special consideration to areas with high CWEs. These items were intended to focus the Access and Travel Analysis on the most relevant processes affecting roads and the aquatic environment.

They were based on findings and discussions contained within the Lower Scott Ecosystem Analysis. They were not intended to cover **all** potential impacts roads may have on aquatic systems.

Mass wasting is indicated by potential landslide sediment delivery to stream channels. This is determined based on the stability of the geomorphic terrane typed each road segment passes through. For example, a road segment that passes through an active landslide, toe zone, inner gorge, or dissected granitic land has a high sediment delivery potential.

Surface erosion is indicated by potential surface sediment delivery to stream channels using a combination of four indicators: soil type, road surface type, proximity to stream, and human use level. All four indicators received equal weighting. Soil type was identified using the erosion hazard rating (EHR) based on soil type and slope.

Alteration of hydrologic integrity is indicated by a road's potential to: alter physical stream channel dynamics, divert a stream, or extend a stream network. This was measured by the number of road and stream intersections on a given road segment.

Road-related impacts to Riparian Reserve integrity are indicated by an overall loss of riparian habitat. This was measured by length of road segments within Riparian Reserves. Since the focus here is on riparian habitat, the unstable lands components of Riparian Reserves (dissected granitic lands and toe zones of slumps and earthflows) are not included. These components are included in the mass-wasting indicator.

Special consideration is given to areas with high CWEs based on the CWE assessment from this analysis. The combined index values of 7th-field watersheds are used to determine a road's rating.

The aquatic processes, indicators, and rating criteria used to assess roads for the Access and Travel Analysis (Appendix E Access and Travel Analysis) are shown in Table 5-7.

Table 5-7 Access and Travel Analysis Aquatic Criteria				
PROCESS	INDICATOR	HIGH	MODERATE	LOW
Reduce Accelerated Sediment Delivery:	Sediment delivery potential based on geologic type.	Roads through or immediately adjacent to active landslides.	- Roads on other granitics (granitics not included in "high" rating.)	Other roads on dormant landslides with less than 35% slope.
Mass-Wasting.		Roads on toe zone, inner gorge, and dissected granitics.	- Roads on dormant landslides with greater than 35% slope. - Other roads on slopes greater than or equal to 65%.	Other roads on less than 65% slope.

<b>Reduce Accelerated Sediment Delivery:</b>  <b>Surface-Erosion.</b>	<b>Surface sediment delivery potential based on a combination of four indicators a) soil type, b) road surface type, c) proximity to stream, and d) use level.</b>	Three or four "high" ratings in any of the four indicators. [High Erosion Hazard Risk (EHR), 0.25 miles within one site potential tree of stream, native or crushed surface, high human use.]	Any combination of two "high" and two "low" ratings.	Three or four "low" ratings in any of the four indicators. [Low EHR, greater distance than one site potential tree from stream, pit-run, chip seal, or other paved surface, low human use.]
<b>Reduce Alteration of Hydrologic Integrity.</b>	<b>Potential to: alter physical channel dynamics, divert stream, extend stream network, based on road stream intersections.</b>	Road has stream crossings with high diversion potential. (Where risk assessment not completed: road with more than three stream crossings. Stream crossings are counted on perennial and intermittent streams using a 20-acre accumulation model.)	Road has connectivity to a stream channel. (Where risk assessment not completed: road with two to three stream crossings.)	Road has neither diversion potential nor connectivity. (Where risk assessment not completed: road segment with less than two stream crossings.)
<b>Reduce Road-Related Impacts to Riparian Reserve Integrity.</b>  (RR includes stream buffers, active slides and inner gorge.)	<b>Overall loss of riparian habitat (shade, wood recruitment, species travel corridors) based on miles of road in RR.</b>	0.75 or more miles of road within riparian reserve. Greater emphasis placed on fish-bearing streams.	0.25 to 0.74 miles of road within riparian reserve.	Less than 0.25 miles of road within riparian reserve.
<b>Give Special Consideration to Areas With High Cumulative Watershed Effects (CWE).</b>	<b>CWE Assessment from this analysis based on 7th field watersheds.</b>	Combined CWE analysis is 0.9 or greater.	Combined CWE analysis is 0.5 to 0.9.	Combined CWE analysis is less than 0.5.

---

#### **Key Question 4- What are the trends for hillslope processes in the analysis area?**

---

Unstable areas will continue to unravel as natural processes and management activities occur in the analysis area. Landslides and surface erosion will continue, especially when the area is subject to heavy, sustained rainfall or flooding. Accelerated erosion rates resulting from past fires (1987) and the 1997 flood will continue to recover. The probability of future severe fire adversely affecting hillslope processes will increase as fuel levels continue to increase. Sediments from the 1997 flood are expected to be re-worked, moved throughout stream channels, and out of the Scott River system over the next ten years. Sediment produced from similar future flood events are expected to be relatively unstable for a decade after the event. Direct management impacts from timber harvest will decline overall compared to the past several decades, primarily due to the designation of many areas as administratively withdrawn from programmed timber harvest. The extent of the road system will likely decrease. Unless opportunities in the Access and Travel Analysis are implemented, long-term lack of road maintenance will increase sediment delivery to stream channels from surface erosion, mass wasting and culvert failure. Roads will continue to suffer damage during floods due to inadequate road/stream crossings, inadequate surfacing, landslides, and other road stability problems.

#### **DESIRED CONDITIONS**

--Watersheds are resilient to natural disturbance and management activities. Management activities lead to recovery of impaired watersheds. Future management activities in non-impaired sub-watersheds do not lead to impaired condition so over the long-term, none of the watersheds are impaired or nearing impairment threshold.

--Management of the road system is adequate to manage the land while minimizing impacts to aquatic resources. The Access and Travel Analysis is utilized to identify road repair, storage, and decommissioning projects.

--Fuels conditions are such that the risk of severe fire effects is small throughout the watershed.

### **Riparian Areas**

---

#### **Key Question 1- How have Riparian Reserve acreage estimates evolved from the *Forest Plan* through this analysis?**

---

Three Riparian Reserve mapping estimates are available for the analysis area; the *Forest Plan* estimate, the current Forest-Wide streams and unstable lands estimate, and the estimate derived from the Forest-Wide coverages supplemented in this analysis. The acreages for each are displayed in Table 5-8 Riparian Reserve Acres. The

supplemented Forest-Wide estimate is the most likely to depict actual Riparian Reserve extent, although it is still an estimate, made at a watershed scale. Actual Riparian Reserve boundaries need to be ground verified at the project level.

<b>Table 5-8 Riparian Reserve Acres</b>		
<b>Description</b>	<b>Acres Outside Wilderness and Administratively Withdrawn Areas</b>	<b>Total Acres</b>
Original Klamath <i>Forest Plan</i>	5,205 <sup>1/</sup>	Not Available
Updated with Forest-Scale Unstable Lands & Stream Mapping <sup>2/</sup>	9,500	19,301
<sup>1/</sup> The <i>Forest Plan</i> assumes that 44% of remaining Matrix lands is considered unmapped Riparian Reserves. <sup>2/</sup> uses unstable lands mapping as of September, 1997 and updated stream buffers, using 20 acre accumulation model for stream mapping and 170 ft. buffer on each side of stream. Also includes additional unstable lands mapping done for this project.		

The *Northwest Forest Plan Record of Decision (ROD)* and the *Forest Plan* designated Riparian Reserves as a land allocation. Mapped Riparian Reserves are displayed and used for acreage estimates in the *Forest Plan*. The mapped Riparian Reserves consist of unstable lands mapping available during the *Forest Plan* analysis, but does not include stream buffer mapping, not available at that time. Due to the lack of stream buffer mapping, an additional 44% of Matrix lands (land allocations outside of wilderness and administratively withdrawn areas) are assumed to be unmapped Riparian Reserves in the *Forest Plan*.

The Riparian Reserve acreage estimates described in Step 3 Riparian Areas, are derived from updated geomorphic and stream buffers mapping (update version for each, September 1997). The Riparian Reserves include the unstable lands geomorphic types; active landslides, toe zones of dormant landslides, and all types of inner gorge. The stream buffer mapping includes 340-foot buffers (approximately two site potential tree heights for the area) on fish-bearing streams and lakes, and 170 foot (one site potential tree) on non-fish bearing perennial and intermittent streams, marshes, and springs. The streams, marshes, and springs mapping is based on USGS 1:24,000 quad maps supplemented with additional streams based on a 20-acre accumulation model. The 20-acre accumulation model predicts the beginning of a stream, assuming 20 acres of land draining to a single point will initiate an "annual scour" stream; "Annual scour" is used as described in the *ROD* and the *Forest Plan*. The model has been spot tested in Elk Creek, Beaver Creek, Callahan, and the Lower South Fork of the Salmon River watershed analysis areas, and has shown to give a good estimate of stream extent in those areas. The 20-acre accumulation model streams have been incorporated into Forest wide streams and stream buffers coverages.

In addition, project level delineation of Riparian Reserves will result in changes to the unstable lands geologic data layer. This will be due to both under-mapping or over mapping of unstable geomorphic terranes (active landslide, toe zone, inner gorge, dissected granitic lands) at the Lower Scott ecosystem analysis level.

Based on project level mapping samples done on the Salmon River District, the following changes to Riparian Reserve acreage may occur at the project level in the Lower Scott area. Mapped active landslide acreage will likely increase (primarily slumps and earthflows not visible on air photos). This proportion increase would be very small since active slides usually occupy less than one percent of the land base. Mapped toe zone acreages will likely increase. Mapped inner gorge acreages will likely decrease on smaller streams (first to third order), and on floodplains. However, much of the over-mapped portion in these areas may still be in Riparian Reserves due to proximity to streams. Dissected granitic lands can increase or decrease. There is not a good sample of project level mapping of these areas to draw conclusions from.

---



---

**Key Question #2 - What are the natural and human causes of change between historical/reference and current riparian area conditions, including the impacts of roads and other disturbances?**

---



---

The wildfires of 1987, and the 1997 flood were natural events that impacted many acres of riparian area by changing vegetation seral stage and increasing erosion potential. Fire suppression activities result in a build-up of available fuel and can put upslope riparian areas at risk to high fire severity. Portions of upslope riparian reserves burned at high intensities during the 1987 wildfires, especially in the headwaters of Deep and Tompkins Creeks, consuming vegetation, which provided hillslope stability, large wood recruitment, and shade. The intense rainfall that occurred during the 1997 flood resulted in debris torrents in both these stream channels.

Mining was the probably the earliest Euro-American activity to impact riparian areas in the analysis area. Placer mining along the Scott River and several tributaries disrupted stream channels and riparian vegetation, primarily in the 1890 to 1920 time period. Most of these old placer workings have become revegetated although evidence of past workings can still be seen. Mining that occurred in ore deposits generally had little effect on riparian areas. Currently, the mining that occurs in the analysis area is primarily suction dredging in the Scott River.

Upstream from the analysis area, ranching and farming impacted the riparian areas in Scott Valley. Diversion ditches were constructed decreasing summertime stream

flows, streams were channelized, and riparian vegetation removed to open ground for agriculture. Work along the Scott River and some lowland tributaries has been done to confine stream channels and minimize potential flood damage. The current condition of irrigated fields and well-confined streams is much different than the marshy, wooded lowlands that likely existed prior to Euro-American settlement. These conditions have contributed to lowered flows and raised summer water temperatures downstream, in the analysis area.

The discharge of the Scott River is gauged at one point, river mile 19, which is at the upper end of the analysis area and the lower end of the Scott Valley. Water rights for the Scott River were adjudicated in 1980 and the Forest Service was granted an instream flow right for the mainstem Scott, as measured at the USGS gage. In a number of years since 1980, these instream flows have not been met. The most common period this occurs is in the late summer and early fall, especially following a below-normal winter. Although the Scott River has historically experienced episodes where the flow diminishes to a very low level, or ceases altogether, it appears that the cumulative agriculture use of large volumes of water through the summer months, draws down the ground water surface to the point where Scott River has diminished stream flows. There is some disagreement as to the exact cause and effect of agricultural use of water on stream flow, however, the effect on instream water and instream habitat conditions results in less than desirable conditions for aquatic dependent species.

Roads and timber harvest are additional human-caused disturbances affecting the riparian areas today. Roads are a high impact due to the long-term loss of growing site for vegetation and potential sources of eroded sediment. Roads constructed adjacent to streams generally result in a loss of riparian vegetation to improve driver visibility, and reduce hazard trees falling on roadways. As a result there is reduced stream shading, causing increased stream temperatures, reduced large wood recruitment, and overall loss of habitat for aquatic and riparian species (USFS 1999). Timber harvest is a temporary change in erosion potential and vegetation seral stage, also affecting sediment inputs to streams, stream shading, and large wood recruitment.

---

**Key Question #3 - How do the current riparian habitats compare to optimum habitats, and how can riparian areas be protected and/or restored? What poses problems to stream channel stability and resilience?**

---

Information from stream habitat surveys can be used as a descriptive tool for assessing aquatic habitat conditions. Various problems arise, however, when attempting to set standard thresholds for stream habitat parameters. One set

of criteria cannot fit all streams. Scaling stream habitat parameters to the size of a stream and geologic morphology of its watershed can be difficult. Pools in smaller streams tend to be shallower than pools in larger streams. Streams in a watershed having large areas of decomposed granitic terrane generally have a higher percentage of fines in the substrate than streams within watersheds where most of the terrain is composed of competent bedrock. Other problems arise because there is very little information on reference stream habitat conditions and ranges in reference data vary widely.

Because optimum habitat conditions for Lower Scott streams are largely unknown, reference habitat parameters from three sources are used in this analysis. Reference conditions for instream habitat components have been identified in measurable elements in the Forest Plan. National Marine Fisheries Service (NMFS) has established measurable indicator criteria to determine if stream ecosystems are at a properly functioning condition. Habitat parameters from unmanaged streams within the Scott River Ranger District are also used as reference conditions. Table 5-9 Reference Habitat Components, summarizes the three sets of reference habitat values (only water temperature and fish habitat parameters presented in Step 3 are displayed).

**Table 5-9, Reference Habitat Components**

Parameter	Forest Plan	NMFS Matrix	Scott River District Reference
<b>Water Temperature</b>	Below 70°F	Below 69°F	N/A
<b>Pool Frequency</b>	One Pool Every Three to Seven Bankfull Widths	One Pool Every Three to Seven Bankfull Widths.	<b>One Pool Every Four Bankfull Widths</b>
<b>Maximum Pool Depth</b>	At Least 3 Feet	At Least 3 Feet	<b>Not Applicable</b>
<b>Canopy Cover</b>	80% Surface Shading	Not Applicable	<b>76% Surface Shading</b>
<b>Coarse Woody Material</b>	20 Pieces Per 1,000 Lineal Feet (24" Diameter x 50' Length)	>20 Pieces/Mile (>24" Diameter x >50' Length)	<b>See Table 5-10, below</b>
<b>Substrate</b>	Not Applicable	Not Applicable	<b>Gravel, Cobble Dominate</b>
<b>Fine Sediment</b>	<15% in Spawning Gravel	<15% in Spawning Gravel	<b>8% Overall, 2% in Pool Tailouts</b>

Determination of habitat criteria from the Forest Plan is based on the "Draft Proposal For managing and Monitoring Streams For Fish Production" (Sedell 1988), local data and current literature. Sedell's proposal was intended to provide direction for Forest Plan application in Oregon and Washington Forests in the Columbia River Basin. These may be adjusted to the Klamath National Forest as additional information is obtained.

The National Marine Fisheries Service Matrix of Factors and Indicators is used to document baseline stream and watershed conditions. Current aquatic conditions for each surveyed stream in the assessment area are compared to NMFS indicator criteria to determine "Functioning", "At-Risk", or "Not Properly Functioning" habitat components. The indicator criteria used for this assessment are shown in Table 5-10 Matrix of Factors and Indicators. Appendix C -

Aquatic Habitats, contains completed comparison tables titled "Justification of Matrix of Factors and Indicators" for each surveyed stream. These tables display determinations of "Properly Functioning", "At- Risk", and "Not Properly Functioning" habitat components and the justification behind the determinations. The NMFS matrix criteria must be used for each Klamath National Forest proposed project to meet obligations of compliance under the Federal Endangered Species Act.

**Table 5-10, Matrix of Factors and Indicators**

FACTORS	INDICATORS	PROPERLY FUNCTIONING	AT-RISK	NOT PROPERLY FUNCTIONING
<b>WATER QUALITY</b>	<b>Temperature</b>	69 °F or less	69 to 70.5 °F	>70.5 °F
	<b>Turbidity</b>	Turbidity Low	Turbidity Moderate	Turbidity High
	<b>Chemical/Nutrient Contamination</b>	Low levels of contamination from agriculture, industrial, and other sources: No excess nutrients	Moderate levels of contamination from agriculture, industrial, and other sources: some excess nutrients	High levels of contamination from agriculture, industrial, and other sources: high levels of nutrients
<b>HABITAT ACCESS</b>	<b>Physical Barriers</b>	Man-made barriers allow upstream and downstream passage at all flows	Man-made barriers do not allow upstream and/or downstream passage at base/low flows	Man-made barriers do not allow upstream and/or downstream passage at a range of flows
<b>HABITAT ELEMENTS</b>	<b>Substrate</b>	Less than 15% fines in spawning habitat and cobble embeddedness less than 20%	15 to 20% fines in spawning habitat and/or cobble embeddedness is 20 to 25%	Greater than 20% fines in spawning habitats and cobble embeddedness greater than 25%
	<b>Large Woody Material</b>	More than 20 pieces of large wood per mile and current riparian vegetation condition near site potential for recruitment of large wood	20 pieces or less of large wood per mile or current riparian vegetation condition below site potential for recruitment of large wood	Less than 20 pieces of large wood per mile and current riparian vegetation condition well below site potential for recruitment of large wood
	<b>Pool Frequency</b>	One pool every 3-7 bankfull widths. Pools should occupy 50% of the low flow channel width and all have a max depth of at least 36 inches	One pool every 3-7 bankfull widths. Pools should occupy 50% of the low flow channel width and half have a max depth of at least 36 inches	Less than 1 pool every 7 bankfull channel widths and/or less than half of the pools have a max depth of at least 36 inches
	<b>Off-Channel Habitat</b>	Backwaters with cover and low energy off-channel areas	Some backwaters and high energy side channels	Few or no backwaters or off-channel ponds
	<b>Refugia</b>	Refugia exist and are adequately buffered, sufficient in size, number and connectivity	Refugia exist but are not adequately buffered, are insufficient in size, number and connectivity	Adequate refugia do not exist
<b>CHANNEL CONDITIONS AND DYNAMICS</b>	<b>Width/Depth Ratio</b>	W/D ratio <12 on all A, G, and E channel types. W/D ratio >12 on all B, F, and C channel types	More than 10% of the reaches are outside of the W/D ranges given for properly functioning	More than 25% of the reaches are outside of the W/D ranges given for properly functioning
	<b>Streambank Condition</b>	>90% stable i.e., on average <10% of banks are eroding	80-90% stable	<80% stable
	<b>Floodplain Connectivity</b>	Off-channel areas are frequently linked to main channel. Overbank flows occur and maintain wetland functions, riparian vegetation and succession	Reduced linkage of wetland floodplain and riparian areas to main channel. Overbank flow reduced as evidenced by moderate degradation of wetland function, riparian vegetation, and succession	Severe reduction in connectivity between off-channel wetland, floodplain, and riparian areas. Wetland are drastically reduced and riparian vegetation and succession altered significantly
<b>FLOW HYDROLOGY</b>	<b>Changes in Peak/Base Flows</b>	The Risk Ratio in the ERA model is less than 0.5	The ERA Risk Ratio is between 0.5 and 1.0	The ERA Risk Ratio is greater than 1.0
	<b>Increase in Drainage Network</b>	The density of road/stream crossings is less than 3 per square mile	The density of road/stream crossings is between 3 and 6 per square mile	The density of road/stream crossings is greater than 6 per square mile
	<b>Road Density</b>	Less than 2 miles per square mile	Between 2 and 4 miles per square mile	Greater than 4 miles per square mile
<b>WATERSHED CONDITIONS</b>	<b>Disturbance History (landslide model)</b>	Current condition in the landsliding model is less than 100 percent over background	Current condition in the landsliding model is between 100 and 200 percent over background	Current condition in the landsliding model is greater than 200 percent over background
	<b>Disturbance History (surface erosion model)</b>	Current condition in the surface erosion model is less than 400 percent over background	Current condition in the surface erosion model is between 400 and 800 percent over background	Current condition in the surface erosion model is greater than 800 percent over background

	<b>Riparian Reserves</b>	Less than one percent of Riparian Reserve is roaded and less than 10 percent is <40 year old plantation or stand replacing fire	Between one and two percent of Riparian Reserve is roaded or between 10 and 20 percent is <40 year old plantation or stand replacing fire	Greater than two percent of Riparian Reserve is roaded or greater than 20 percent is <40 year old plantation or stand replacing fire
--	--------------------------	---	---	--

Reference streams used for the Scott River Ranger District are either wilderness stream reaches or stream reaches that are primarily un-roaded and un-managed. They are considered to have pristine conditions for the Scott River Basin area. Table 5-11 displays reference habitat

parameters for Scott River District Streams. Table 5-12, Reference CWM, summarizes instream wood values for Scott River District un-managed streams. Values for Scott River District reference streams are averaged across all channel types, watershed areas, and elevations.

**Table 5-11, Scott River District Reference Habitat Parameters**

Stream	WA Area	Reach Length	Width/Depth	% Substrate composition 1/					Pool Tailouts	Channel Widths/Pool 2/		# of Pools/Mile		% Shade 3/
				Fines	Gravel	Cobble	Boulder	Bedrock		SCI	Primary	SCI	Primary	
	(ac)	(m)							% Fines					
W Boulder	1,500	449	26	29	17	33	21	0	6	3	0	140	0	69
Up Sugar 1	2,500	474	18	9	22	3	12	53	<1	2	12	160	31	62
Up Sugar 2	2,500	386	18	11	27	21	22	18	<1	3	29	134	13	90
Up Sugar 3	2,500	904	18	4	36	16	39	5	<1	2	25	157	14	75
L Etna Mill 1	6,700	328	40	12	39	10	12	31	<1	2	7	88	25	84
L Etna Mill 2	6,700	379	40	15	44	10	31	35	<1	1	14	157	13	78
U Etna Mill 1	6,700	730	31	-	32	34	33	4	<1	2	0	90	0	83
U Etna Mill 2	6,700	527	31	1	15	12	26	45	<1	1	21	168	9	65
Wooley 1	9,500	871	23	3	13	38	35	11	<1	6	17	26	9	79
Wooley 2	6,000	620	-	1	28	35	18	19	N/A	N/A	N/A	N/A	N/A	-
Wooley 3	15,700	862	31	2	30	39	25	46	4	9	10	11	9	-

1/ Substrate particle size breakdown; fines = <4mm, gravel 4-64mm, cobble 64-256mm, boulder >256mm

2/ Bankfull channel width divided by number of pools in each category. SCI pools are of a depth at least two-time that of the pool tail crest. Primary pools are greater than Three feet in depth.

3/ Average percent shade includes both canopy cover and topographic shade; not just vegetation.

SCI Protocol version 3.4 (6/27/96)

**Table 5-12, Reference CWM 1/**

Diameter Class 2/	Pieces	Volume (cume)	Length class (m) 2/	Pieces	Volume (cume)
<.4	10.8	6.3	2-8	10.1	10.8
.4-.8	12.3	47.7	8-16	9.5	31.6
.8	2.3	43.6	16+	5.9	55.2
<b>TOTAL</b>	<b>25.4 3/</b>	<b>97.6</b>	<b>TOTAL</b>	<b>25.5 3/</b>	<b>97.6</b>

1/ All values are per 1,000 lineal feet of stream.

2/ Minimum diameter = .4m, while minimum length varied and usually was 3+ Meters.

3/ Approximately sixteen pieces of wood (>.4 m in diameter & >2+ m in length)

Were found on avg/1,000' of channel length. Of this, 4.8pieces/1,000' were > .4m

(About 16") in diameter and 7.9 pieces were > 8m (26.2') in length.

Volume (cubic

Meters) averaged 24.8/1,000' of channel.

moderate to small streams in the Lower Scott assessment area. In some cases this may have resulted in a determination of Not Properly Functioning or At-Risk when the negative connotation of these labels may not always be warranted. Thresholds for habitat parameters in the *Forest Plan* and NMFS matrix may need refinement. More thorough analysis of existing data and further surveys of undisturbed streams could help refine appropriate ranges of conditions for comparing current to reference aquatic habitat quality.

Successful recovery efforts will conserve and restore the long-term dynamics of watersheds, rather than just habitat attributes. Meeting any given management-imposed habitat standard may or may not reflect the health of a stream. Maintenance of critical stream processes, such as the regimes of water; sediment and woody material delivery are more likely to result in the successful conservation of aquatic dependent species.

Many of the values for fisheries habitat criteria in the *Forest Plan* and environmental indicators in the NMFS matrix may be inappropriate, especially when applied to

Overall, most of the stream habitat condition values are in line with properly functioning habitat conditions from both the *Forest Plan* and the NMFS Matrix of Factors and

Indicators. Most exceptions are low pool frequencies, high amounts of fine sediments, and low numbers of key large woody material.

Cool, deep pools are critical for summer holding and rearing habitat. Spawning takes place in the deposited gravel in pool tailouts. Several amphibian species require cool, deep pools high in dissolved oxygen for successful breeding. Pools can also be highly sensitive indicators of changes in watershed conditions (EPA 1991). Pools are categorized into two classes: primary pools with a depth of at least one meter, and SCI pools with a depth greater than two times the pool tail crest.

Two of the ten reference reaches and five of the eleven managed reaches have no primary pools. However, frequencies of primary pools, for streams that have them, are similar for both managed and reference streams. Neither managed nor reference streams meet the NMFS pool frequency criteria for properly functioning because of the depth requirement. A 36-inch depth may be an unrealistic standard for smaller sized, high gradient streams in the Scott River system.

Reference reaches exhibited a much higher frequency of SCI pools than was found in managed streams: an average of one pool every 2.9 bankfull units for reference streams, versus an average of one pool every 4.9 bankfull units for managed streams. However, using the SCI pool measurement, Canyon Creek is the only stream that does not meet reference conditions for pool frequency.

Stream temperatures are related to water temperatures in headwater streams, solar radiation, air temperature, stream gradient, and flow. The amount of solar radiation hitting the stream is influenced by the amount of vegetative and topographic shade. During the summer months, temperatures greater than the optimum required for salmonid growth can occur in the mainstem Scott River. Overall, the managed streams have a slightly higher amount of shading than the non-managed reaches. Over 85 percent canopy closure exists in Canyon, Mill 1, Mill 2, Pat Ford, and Wooliver 2 stream reaches. Eight out of nine non-managed streams, as well as, Deep, Kelsey, Middle, and Tompkins Creeks do not meet Forest Plan canopy closure criteria.

Large wood provides a source of cover and habitat diversity for fish through a range of flows and seasonal conditions. It is important for diversifying the habitat of amphibians and other riparian dependent species. Wood serves an important role in maintaining healthy stream channels. Out of all managed and reference streams, one managed stream, Pat Ford, met the NMFS properly functioning value of 20 pieces/mile. If the NMFS size

classes for "East Side" wood frequencies are used (a less stringent criteria of greater than 12 inches in diameter and greater than 27 feet in length), the majority of streams exceed the criteria. Development of size criteria in-between these two may be more appropriate to Scott River tributaries. None of the streams met or exceeded the *Forest Plan* value of 105 pieces/mile.

Frequencies of all wood, regardless of size, showed large fluctuations by reach. Tompkins Creek had a very high frequency of all wood, 2700 pieces per mile. This value is five times greater than the next highest frequency, and could be attributed to a debris torrent from the January 1997 flood. Overall, average wood frequencies were higher in managed streams than in reference streams. However, an analysis of cubic volume of wood showed that reference streams contain a larger percent of large volume wood than managed streams. Managed streams contained a majority of wood volume in pieces of intermediate size (diameter = 0.4 - 0.8 meters, length = 8 - 16 meters) while reference streams contained a majority of wood volume in larger pieces of wood (diameter = greater than 0.8 meters, length = greater than 16 meters).

The composition of streambed material influences the flow resistance in the channel, stability of the bed, and quantity as well as quality of aquatic habitat available to developing eggs, small fish, and invertebrates (Olson and Dix 1993). Streambed quality for aquatic organisms is highly dependent on amounts of surface fines and substrate embeddedness; a measure of the extent that large streambed particles are surrounded or buried by fine sediment. Excessive fines and embeddedness decreases embryo and fry survival and emergence, decreases or alters invertebrate populations that serve as a food base, decreases rearing habitat available for juvenile salmonids, and decreases pool frequencies. Reference streams were primarily bedrock or boulder dominated with lesser amounts of cobble and gravel. Managed streams were largely composed of gravel with lesser components of boulder and cobble. All streams had 12% or less fines in pool tailouts except for one managed stream, Deep Creek. Overall managed streams had higher fine sediment levels than the reference streams, especially in spawning gravels, but fines levels were meeting both NMFS and Forest Plan criteria.

---

---

#### **Key Question #4 - What are the trends for riparian areas in the watershed?**

---

---

Riparian areas and channels affected by the 1987 wildfires will continue to recover, especially in Deep and

Tompkins Creeks as trees become established and grow. Lands affected by the 1997 flood will also continue recovering for the next decade throughout the assessment area, barring any additional disturbance; riparian vegetation will slowly increase and shade will improve. In stream channels not severely affected by the flood or fires, the proportion of dense, late-seral vegetation in riparian areas will increase, as trees grow larger and older. Some dense, early-seral stands may stagnate as tree densities approach site capacity. Poor site quality areas will probably change little over time. Overall instream aquatic habitat should slowly improve over time as the impacts of the fire and flood continue to diminish. However, some upslope riparian areas will remain at risk to high severity fire until adjacent high fuel loadings can be reduced. Pool habitat will increase in heavily scoured streams over the next decade. Riparian area conditions will continue to fluctuate with future intense storm events and wildfires.

Streams within subwatersheds with high road densities, poor road conditions, and high disturbance histories will continue to experience chronic sediment inputs. Repair of known road-related erosion problems, decommissioning of unneeded roads, and appropriate logging practices in matrix will decrease sediment impacts in the long-term. Provided future flood events, wildfires, road building, and timber harvesting activities do not severely impact large areas, watershed processes should continue toward reference conditions.

#### DESIRED CONDITIONS

--Mid to late-seral stands in Riparian Reserves are maintained over the long-term at a percentage consistent with reference conditions. Riparian Reserves, especially in headwater areas are resilient to fire. Connectivity for late-seral wildlife is also maintained.

--High quality aquatic habitat exists in all streams with adequate amounts of pools and LWM in streams as site capacity allows.

--Habitat is sufficient for sustainable populations of indigenous aquatic species including flow and temperature conditions, especially in mainstem Scott River. Fine sediment input, accumulation, and transportation in streams are reduced to levels consistent with good quality aquatic habitat.

--Roads, dispersed recreation sites, and other human developments in riparian areas are maintained to achieve attainment of *Aquatic Conservation Strategy* objectives and there is reduced habitat disturbance from management activities.

--Riparian features are well identified on maps and on the ground.

### Aquatic Dependent Species

---

---

#### Key Question #1 - What are the natural and human causes of change between historical/reference and current species distribution and populations sizes?

---

---

As stated in Step 4, Aquatic Dependent Species, it is assumed that there is a substantial decline from historical levels in the abundance of all anadromous species and in their diversity of life history patterns within the Scott River sub-basin. Weakened anadromous populations within the sub-basin have been impacted by aquatic habitat loss, often seasonal in nature, habitat degradation and simplification, and loss of habitat connectivity. As aquatic habitat becomes degraded or unavailable in the Scott River system, anadromous fish production throughout the sub-basin, including the analysis area, is weakened. The introduction of non-native fish species in mountain lakes may also be negatively affecting native populations.

The valley portion of the Scott River lies upstream of the analysis area. The Scott Valley is a significant agricultural production area with alfalfa being a major crop. Historically, irrigation was done by flooding from diversion ditches, which often emanated from either the mainstem Scott River or tributaries. Since the 1960s, groundwater pumping, resulting from the availability of rural electricity, has increased significantly. Groundwater pumping lowers water tables during the growing season and causes groundwater to actually flow away from river and stream channels into cones of depression surrounding each irrigating well. As a result, river surface flow can be diminished.

Due to the geographical location of the Scott sub basin, low annual precipitation amounts, high evapo-transpiration rates, and the deep alluvial nature of Scott Valley proper, stream flow in some of the major valley tributaries may have historically gone subsurface during low rainfall years. Even some valley portions of mainstem Scott River appear capable of going dry a few times a century. Historically, many beaver dams were present and probably provided high quality habitat for salmonids even in areas where flow went subsurface during dry summer months. These beaver dams may have been located at places where water tables were higher and

provided secure refuge in dry areas until stream flow was re-established. Low numbers of beavers are still present in Scott Valley but beaver dams, especially on the low gradient portion of the valley and its tributaries, are virtually gone.

Increased water usage in recent decades within the valley portion of the Scott, especially by groundwater pumping, has probably increased the frequency, duration, and the extent of reduced or no flow in the main river and in major valley tributaries such as Kidder and Shackleford Creeks. This impact results in a direct loss of habitat. This process can occur abruptly with the onset of the growing season, sometimes as early as April or May, and extend until significant fall rains re-establish flow, October to November.

The valley portion of the Scott River is very low gradient and historically supported a very productive fishery. However, channelization by the Army Corp of Engineers in the 1930's resulted in a loss of channel meanders and an increase in stream straightening. This action, combined with unrestricted grazing in riparian areas, also contributed to a loss of riparian vegetation and streambank support. Both processes have resulted in increased width to depth ratios, increased down cutting, and a loss of undercut banks and side channels.

The increased width to depth ratios of the river and declines in riparian vegetation, have combined with decreased summer flows to increase water temperatures, especially during the summer months. All of the preceding processes have contributed to degraded aquatic habitat, negatively influencing carrying capacity and the over-summering and over-wintering capabilities of the area.

Water temperatures within the valley portions of the Scott River may approach or even exceed 80 degrees Fahrenheit. In many years, juvenile salmonid rearing is virtually missing in the valley portion of the Scott due to low flows and high temperatures. If fish are not left stranded in isolated pools in the lower portion of the valley tributaries, juvenile salmonids are assumed to flee to the Lower Scott analysis area to rear. This effect is diminished in years with cool summers, good snow packs, and longer periods of spring runoff.

Effects of diminished flows and elevated stream temperatures continue downstream into the analysis area. Both the amount and quality of available habitat is reduced, although flows and water temperatures are slightly improved by the contribution of several perennial, coldwater tributaries, i.e. Boulder, Canyon, and Kelsey Creeks. In general, present-day summer low flows and

the associated warm stream temperatures in the mainstem Scott are thought to especially impact those salmonid species, such as coho and steelhead, which generally spend one or more years in freshwater before emigrating to the ocean. Fish health problems also begin to arise as poor water quality and high stream temperatures are encountered.

In addition to creating a loss of habitat, and degraded habitat condition, low flows and warm stream temperatures also cause a break in habitat connectivity, especially for anadromous populations, between upriver and downriver areas. A well-connected river/tributary system facilitates a diversity of life history patterns and habitat utilization, which strengthens the persistence of anadromous populations.

As a result of habitat connectivity loss, smolt out migration may be unduly hastened, resulting in small smolt size and reduced ocean survival. Out migration can even be terminated by the presence of thermal barriers or dry sections of stream channels. As the historically most productive, low gradient, areas in the Scott Valley become either impaired or unavailable during much of the summer period, fish that would normally rear in the valley may be forced to rear in the canyon area of the Scott. Lower Scott rearing may also become restricted, especially as summer stream temperatures begin to rise and flows begin to drop, and fish may be forced to rear in greater numbers in less productive tributaries or even flee the entire Scott River system altogether.

At times these conditions also exist in nearby Shasta River, and in mainstem Klamath River coming out of Irongate reservoir. The net impact of the preceding conditions has probably also contributed to the loss of early run fish, such as summer steelhead and spring Chinook, and a general reduction in fall/winter run steelhead and coho salmon in the mid Klamath region.

Diversion ditches, many of which have been in use since the 1800's, can also disrupt habitat connectivity. A loss of out migrating juvenile salmonids can occur as they become entrained in the water flowing into ditches. The result is often young fish stranded on an agricultural field. Many diversion ditches have been screened to avoid this loss but significant unscreened diversions still exist.

Other connectivity problems in the Scott River are derived from disrupted river flow in the dredger tailing area, several miles in length, near Callahan. River flow in this area is primarily subsurface by late summer each year. Upper sub-basin anadromous stocks require the analysis area (lower sub-basin) to complete portions of their life history (rearing, out migration, etc.). It is also

expected that fish from the analysis area may require use of the upper sub-basin for prime over wintering habitat, and crucial feeding and rearing ventures, for example, steelhead half-pounder runs that follow Chinook salmon upstream during spawning to feed on salmon eggs.

The impacts of high mountain lake fish stocking on other native aquatic populations within the analysis area and sub-basin are unassessed. The introduction of fish into previously barren mountain lakes can result in a decline of native invertebrate and amphibian populations. At the same time, a popular sport fishery is established within the lake and usually in previously barren stream reaches below the lakes. Stocked fish also move downstream into anadromous reaches where they compete with native fish for habitat. It may be possible that some interbreeding may occur between introduced and native fish of the same species. The outcome of this occurring, or the potential of negative genetic impacts, is also unassessed.

---

---

**Key Question #2 - What are the risks/trends to areas critical for maintenance, protection and recovery of aquatic dependent species and how can they be mitigated?**

---

---

The analysis area, which is critical for anadromous rearing and holding for the entire Scott sub basin, will continue to be impacted by low summer flows and poor water quality conditions, especially water temperature, generated upstream. These conditions will likely persist until water use and land use practices in the Scott River Basin are modified. Significant strides in riparian protection in the valley on private land are occurring but the collective restoration of the valley channel structure and desired summer flows, have not yet been initiated.

The continued participation of the Klamath National Forest with the Scott River Watershed Council is important in working towards both favorable flow levels and water quality within the Lower Scott Analysis Area.

---

---

**Key Question #3 - What are the population trends and desired conditions for aquatic dependent species in the watershed?**

---

---

**TRENDS**

The anadromous fish populations within the analysis area will continue to be influenced by upriver sub basin conditions, mainstem Klamath River conditions, ocean conditions and harvest levels. Long-term solutions for this area will require continued improvement of habitat factors, including obtaining a suitable flow, water temperature and sediment regime, especially in the mainstem Scott River and in several main tributaries.

**Salmonids:**

**Fall Chinook:** Large, recent runs (estimated 12,000+ fish) have occurred in 1996 and 1997, and were thought to result from severe ocean harvesting restrictions in place at the time. Smaller runs (estimated 2500-3500 fish) have occurred in 1998 and 1999. The smaller run in 1999 is assumed to be linked with the January 1997 flood. Chinook eggs and fry were still in the gravels when severe scouring flows occurred. Chinook populations within the analysis area and the sub basin appear moderately stable and even able to expand when unfavorable habitat conditions are removed. The species appears to sustain itself moderately well in the Scott because juveniles can largely avoid summer low flows and the associated poor water quality conditions. Even greater Chinook production could be expected if the flow, water quality and sediment issues are improved.

**Early-Run Fish (Spring Chinook, Summer Steelhead):** These stocks within the analysis area and the Scott sub basin are not expected to recover in the near future because of a very weakened metapopulation in the mid-Klamath area. Projected poor summer holding conditions, such as low flows and high stream temperatures in the Scott River system also deter their recovery. Similar low flows and poor water quality conditions exist in the mainstem Klamath and Shasta Rivers. Significant improvement in these watercourses, along with the Scott, is necessary to re-establish these early-run salmonids within the mid-Klamath region. Adult strays of these fish will likely continue to explore the Scott system in very low numbers unless metapopulation numbers are decreased even further.

**Coho salmon, Steelhead:** Both species are largely unassessed in the Scott River system. Local knowledge of these species may increase soon due to proposed smolt out migration studies recently initiated by the USFS, USFWS, and CDFG in connection with the Klamath River Instream Flow Study and CDFG steelhead monitoring activities. Because of their listing as a threatened species, wild stocks of coho salmon and steelhead in the Southern Oregon Northern California Ecological Significant Unit are protected by harvest and/or sport fishing regulations. These factors should

allow a small increase in the numbers of adults returning each year, but whether the gain is significant remains to be shown. The apparent cessation of the drought from the 1980's and mid 1990's may also be contributing positively to steelhead populations. Significant increases of coho salmon and steelhead trout within the mid-Klamath region, Scott sub basin, and the analysis area are not expected to occur until stream flow and water quality issues stream temperatures are resolved.

#### **Non-game Resident Fish:**

**Dace, suckers, Sculpins:** Population numbers for these fish over time are unknown, however, populations appear numerous and robust under current water quality and flow conditions. Populations of these fish are expected to continue as at present without any change in water quality or flow conditions. Current spawning substrates for suckers may not be as negatively impacted as those for salmonids within the sub basin.

**Lamprey:** Populations are largely unmonitored, however, it is assumed that adult populations returning to the Scott sub basin to spawn, are much reduced from historical levels. However, during electro fishing and out migration operations, lamprey juveniles (ammocoetes) appear numerous in some areas. The species needs to be monitored more closely to assess population trends.

**Hatchery Fish (Salmonids):** High mountain lake stocking programs are expected to continue at present levels within the sub basin and the analysis area. Some lakes within the analysis area may be self-sustaining in regards to fish populations, but these conditions are currently unassessed. Lakes are expected to continue to supply stocked fish to downstream habitats, including anadromous reaches.

#### **Other aquatic species:**

**Tailed Frogs, Pacific Giant Salamanders:** These species primarily reside in coldwater tributaries within the analysis area and are largely unaffected by water conditions within the mainstem Scott. Population numbers for these species over time are unknown, however, populations appear numerous and robust where encountered during electro fishing projects. Populations are expected to continue at present numbers.

**Freshwater mussels:** This species resides in the mainstem Scott River within the analysis area. Little is known about current or historical populations numbers or conditions. Elsewhere, mussel populations are known to

be negatively affected by excessive sediment levels. Monitoring of mussel populations over time would need to occur to determine existing conditions and possible trends.

#### **DESIRED CONDITIONS**

--Management activities maintain or improve the high quality, cool water contribution of analysis area tributaries to the Scott River.

--Aquatic populations especially threatened and endangered species, within the analysis area increase toward habitat carrying capacity. Current fish range resembles historic range. Genetic and life history knowledge of anadromous fish, especially coho salmon and steelhead stocks, is improved. Public knowledge of anadromous processes and needs is strengthened.

--Summer flow levels are increased and summer water temperatures are decreased in the Scott River as it enters the analysis area, thereby improving connectivity and habitat volume throughout the sub basin. The dredger tailing area near Callahan also needs to be addressed to further restore connectivity within the sub-basin.

--Important upstream low gradient, alluvial valley habitat is restored, providing necessary features for fulfillment of life history requirements for sub-basin stocks.

--Cool water flowing from the Scott River to the Klamath River is increased during the summer months. The entire mid-Klamath metapopulation of coho salmon, Chinook salmon, and steelhead trout is strengthened by improved water quality and summer flows in the Scott River, Shasta River and upper Klamath River. The survival and timely growth of Scott River and other upper mid-Klamath out migrating smolts is promoted.

### **Forest Health**

#### **Key Question 1 - How have the vegetation communities changed over time and what have been the agents of change?**

Comparing the current conditions of the vegetation communities with what was found within the analysis

area at settlement (around 1850), in general, the most obvious change has been in the amount of vegetative biomass that was here historically and the increased amounts that are here now. With much less natural disturbance (fire), the vegetation communities have been allowed to increase vegetative biomass over the years. Small amounts of vegetative biomass have accumulated each year. As time has gone by the sum of these small annual increases is a dramatic increase in vegetative biomass from what was maintained historically to what is currently found in the vegetation communities. Stand densities are currently very dense with 43% of the Douglas Fir mixed conifer community at 80-100% crown closure, 30% at 60-80% crown closure, and only 27% at <60% crown closure. Naturally maintained conditions were much more open, with the majority of area found at 20-60% crown closure. Higher densities were found only near drainage bottoms and low slope positions on north and east aspects.

As discussed in Step 4, research done on fire-scarred trees by Taylor and Skinner (1996) on Thompson Ridge (14 miles northwest of the analysis area) indicates that the fire return interval on south aspects averaged 8 years, and on the east aspects the fire return interval averaged 16 years for the pre-settlement time period (prior to 1850). Another study looked at changes in openings over a period of 41 years during the suppression era (Skinner 1995). This study indicates a decrease in the size of openings by over 10% occurred during the 41 year study period.

Based on these studies and the effects of the frequent natural fire return interval, early-seral vegetation and openings were more prevalent prior to the fire suppression era. The vegetation communities that exist currently were present historically, although changes have occurred in seral-stage, density and the area occupied by fire tolerant and intolerant species. The natural fire regime favored fire tolerant species and communities. Much of the increase in vegetative biomass and stand densities has come from the spread and development of fire intolerant species, especially within the understories of the mixed conifer communities.

The Douglas fir mixed conifer community was naturally maintained with frequent fire in a much more open condition than is found today. Stand densities currently found in this community are very dense, with 73% of the community having greater than 60% crown closure. Most of this density consists of vegetation that has grown in during the fire suppression era. In natural stands the older (pre-suppression era established) vegetation contributes between 20% and 60% of the crown closure depending on the site. The understory was maintained naturally with

grasses, forbs, scattered shrubs and hardwoods (including black oak). Reproduction of conifers would usually occur within areas that burned intensely (to mineral soil) and would be protected from the next fire passing through the area. In comparing naturally maintained conditions with current conditions we find that the overstory of this community has closed in, the understory has filled in, with the exception of harsh sites the ground is completely covered with either living or dead vegetative material and it is extremely difficult to travel through this dense vegetation.

The ponderosa pine mixed conifer was naturally maintained in a very open condition. Much of this community could be described as grass-covered slopes with scattered pines. This community is found mostly on south aspects and the very frequent fire returns on these slopes maintained the naturally occurring grasses, black oak, and ponderosa pine.

Due to site limitations, the ultramafic mixed conifer community has changed the least over time. Currently this community is maintained with less than 60% crown closure. Naturally the Jeffery Pine found on these sites was maintained in an even more open condition than it is currently. This community could be characterized as very open with scattered trees and a rich diversity of wildflowers, grasses and forbs that were adapted to these ultramafic soils and maintained with frequent fire.

In the white fir mixed conifer community with influence by frequent fire, stands were more open and the understory of these stands were maintained relatively clean of litter and open with few sapling and pole-size trees or shrubs. Fires were more frequent on south and west aspects, which limited the extent of this community. This community is intolerant of frequent fire, which would limit the area occupied to north and east aspects. Frequent fires cleaned the forest floor of litter and understory vegetation. In this frequent low to high intensity fire regime, there were pockets of moderate to high fire intensity that helped to create a mosaic of seral stages. Some sites experienced fire less frequent than others. These were found mostly in draws and riparian areas, where an understory of shade-tolerant vegetation was often present. Even these areas were maintained with much less coarse woody material and fewer snags than found on these sites today.

The higher elevation true fir community is much cooler and moister than the lower elevation vegetation communities, resulting in a different natural disturbance regime. Lightning fires, wind throws, and insect outbreaks were and are primary agents of change in this community. True fir is very sensitive to damage by fire

and sometimes even low to moderate intensity fires can kill large trees. Fires were mostly limited in size, with infrequent large fires. In combination, wind throw, insect damage, and lightning fire would create a pattern of groups of even-aged trees that covered areas from several acres to several thousand acres.

In the higher elevation sub-alpine areas, lightning fires were common, but moist conditions, lack of fuel continuity, and barren areas limited the spread and intensity of fires. This community is found in a condition very similar to what was maintained historically, although the loss of frequent small-scale low intensity fires has promoted a build-up of dead and down material and decadence in flowerpot areas where dense stands of mostly red fir and mountain hemlock are found.

With the natural fire regime, the hardwood and hardwood mixed conifer communities were more extensive. These communities do well with frequent fire. South and west aspects were dominated by grass, shrubs and hardwoods (typically Oregon white oak on good sites and canyon live oak on less productive sites).

Riparian vegetation is found in close proximity to streams, lakes and wet meadows. Natural conditions have changed along streams (mostly the Scott River) that were heavily impacted by mining operations i.e., around Scott Bar to the mouth of the Scott River. These areas have been recovering to some extent since the end of hydraulic mining era, which for the most part was from the late 1850's to around 1900. Occasional severe flood events that since 1955 occur on average every 14 years removes riparian vegetation especially along the Scott River. Riparian vegetation usually re-establishes quickly after flood disturbances. The last severe flood event occurred on New Years Day 1997.

Aspen is found in isolated high elevation pockets. At the beginning of the settlement period (1850) the areas occupied by aspen were slightly larger than they are currently. Domestic livestock heavily grazed aspen. Grazing removed sprouts and saplings not allowing new growth. Aspen is a fire-adapted species, sprouting readily after fires. Fire suppression and grazing has encouraged decadence in aspen stands and allowed encroachment by conifer species to occur.

The shrub natural community except for areas that were impacted by the fires of 1987 has gotten smaller and more decadent. This community is mostly found in high elevation harsh sites (rocky, shallow soils), which have not changed over time. The removal of small-scale low intensity fires has allowed for a build-up of litter and for decadence in the shrubs.

The shrub-harvested community was non-existent prior to settlement. These areas were composed of the adjacent vegetation communities, mostly Douglas fir mixed conifer. See descriptions for Douglas Fir mixed conifer, ponderosa pine mixed conifer, white fir mixed conifer, and true fir. These areas now consist of mixed conifer plantations varying in age from 10 to >40 years of age, with 50% at around 15-20 years of age.

In conclusion, the current fire regime, combined with climatic conditions, has directly influenced the development of densely stocked stands within the watershed. Fire suppression strategies have removed fire as a primary disturbance process in the area. The removal of fire has allowed shade tolerant species such as white fir and Douglas fir to fill in and expand in what were once more open, Douglas fir, ponderosa pine and oak stands. Over time, the shade intolerant species are slowly replaced by shade tolerant species. Competition induced stress becomes more prevalent as the quantity of live vegetation increases. The mixed conifer stands have had the most dramatic increase in vegetative biomass. The less productive sites have seen an increase in the hardwood and shrub components, which has had effects on the health of conifers. Increases in stand densities, has lead to increases in competition for limited moisture and nutrients. This in turn predisposes the trees to being susceptible to pest complexes. Higher stand densities have also increased fuel loadings, creating the potential for large catastrophic fire disturbances.

---

---

### **Key Question 2 - What are forest health trends for the watershed?**

---

---

Currently within the analysis area, fire behavior potential modeling has identified 12,411 acres as having high, 30,986 acres as having moderate, and 41,209 as having low fire behavior potential. Within the analysis area 5,786 acres are identified as non-flammable and we have no data for 7,294 acres outside the Forest boundary. The current conditions will burn with more intensity and higher severity than any vegetative condition that has existed in this area in documented history. Investments made for future forested conditions, i.e., plantations are very susceptible to high severity fire. Even with active fire suppression efforts, there is a high likelihood that much of the analysis area will be involved in large-scale wildfire events in the near future.

With dense multistoried stands, an unstable vegetative condition has been created in an area where fire is the dominant disturbance agent. Opportunities to reestablish fire-adapted mixed conifer communities currently exist, but can be lost in an instant. Current policies are too restrictive and expensive to apply projects at a large enough scale to make a significant difference at a landscape scale. As budgets are reduced, the fire suppression and militia organizations are reduced. Also with budget reductions and appeals to road repair projects, road maintenance is reduced and access for fire suppression and forest management is even more limited.

With high stand densities, competition for solar space and moisture increases mortality and susceptibility to attacks from insects and disease. Without some sort of stocking control, natural thinning by fire or forest management, dense stand conditions develop. These dense stand conditions reduce the ability of trees to grow large and promote increases in stand mortality and attacks by insects and disease. Reduced stand vigor and slow growth or even negative net growth is also expected in many densely stocked stands. These stands will also be less resilient to changing conditions such as short duration drought, less resilient to fires and will be more susceptible to stand replacement fires.

The stands at-risk identified in Step 3 have the potential to be lost to fires and/or insects and disease. Table 5-13 Stands At-Risk by Management Area, identifies potential stands at-risk in all management areas and gives the percent of the land base within each of these areas that fit this category.

<b>Table 5-13 Stands At-Risk by Management Area</b>		
<b>Management Area</b>	<b>At-Risk Stand Acreage</b>	<b>Percent of Area</b>
Private Lands	4,159	18%
Wilderness	3,125	16%
Late-Successional Reserves	6,466	31%
Sensitive Species	69	20%
Mapped Riparian Reserves	3,210	34%
Retention	521	57%
Partial Retention	4,277	26%
General Forest	1,285	32%
<b>TOTAL</b>	<b>23,997</b>	<b>25%</b>

Private land owners will manage their lands based on their purpose and needs.

## DESIRED CONDITIONS

Stand densities in mixed conifer and true fir types are commensurate with site capability, and conifer mortality

is maintained to near endemic levels (approximately 1% of the stand).

The desired condition of forest health is to maintain healthy ecosystems consistent with the objectives of each management area. As the objectives of these areas vary, so do the levels of concern for the various factors, which affect forest health. These factors include stand density, levels of insects/disease infestations, levels of mortality, and fire behavior. In wilderness areas little or no management of vegetation is desired, allowing natural processes to function. In LSRs, insect and disease infestations and mortality at moderate levels are desirable because they contribute to habitat characteristics important to late-seral dependent wildlife. In Matrix (Partial Retention, Retention, and General Forest) where commodities production is an important consideration encouraging conifer growth and reducing factors that negatively effect stand health are desired.

## Fire

### Key Question #1 - Where are large areas at risk from catastrophic fire disturbance and what areas are important to treat and/or protect?

Fire behavior modeling has identified 48% of the watershed as having high to moderate fire behavior potential. See Figure 3-11 Fire Behavior Potential, contained in the Map Packet located at the end of this document. Fires occurring in these areas have the potential of becoming large, high intensity burns. These fires have the potential of reducing the amounts of pole, early/mature, mid/mature, late/mature, and old-growth seral stages, while increasing the amounts shrub/forb seral stages.

Plantations on good sites are valuable investments. Protecting these sites is important for wildlife values, visual quality enhancement, and future harvest opportunities. These stands should be evaluated for treatment needs.

Wildfires respond to breaks in topography and vegetation (natural and/or constructed fuelbreaks). Some natural fuelbreaks exist in the analysis area, as well as some fuelbreaks, which are remnants from wildfire suppression and fuels treatment activities. These fuelbreaks can possibly be utilized with little investment, in the future for fuels treatment or fire suppression activities that will protect and promote desired vegetative conditions.

It is extremely important to protect people living in the analysis area and their residences from fire. All residents in the watershed should be concerned and take precautions to protect themselves and their homes from wildfire. Wildfires will continue to threaten residences in the analysis area. Area residents should be encouraged to clear fuels and use defensible space precautions around their homes. Cooperative efforts can be taken to reduce fuels on Public lands adjacent to private property.

Streams providing high quality water also have adjacent vegetative conditions that are prone to high severity wildfire. The complete removal of vegetation, as in a stand-replacing fire, can increase sedimentation, change the flow regimes, and increase stream temperatures, thus degrading aquatic species habitats. This makes it critical to protect these areas from catastrophic fire, which can be made possible by making the upslope areas more resilient to the effects of fire.

Fire starts have occurred within the analysis area every year of the 76-year history of fire start data. Based on the size of the analysis area and the number of starts that have occurred over the 76-year period (732), a risk rating of moderate has been calculated. The natural disturbance regime for the analysis area was dominated by large low to moderate severity fires. Fire suppression efforts over the last approximately 80 years have been, for the most part, very successful in limiting fire spread and effects in the analysis area. This has allowed for vegetation, standing dead, and down available fuels, to increase dramatically from the amounts that were historically maintained.

The current fire suppression organization is still successful most of the time, but can be quickly stretched to its limits during multiple start events. With the high fuel accumulations creating higher fire intensities and making it more difficult to build fire line, fire suppression forces will have less success in the future. In addition, a damaged and poorly maintained transportation system hinders or can make initial attack with engines impossible in some areas. With the continuation of a successful fire prevention program, lightning storms igniting multiple fires will continue to be the source of most fire starts. Based on continuing increases in fuels, these fires will more often overwhelm fire suppression forces, escape initial attack, burn more area, and burn with higher intensities.

Vegetation communities in the analysis area developed, adapted, and were maintained by variations in soils, aspect, precipitation, microclimate, and disturbance. The removal of fire as a frequent disturbance has changed these vegetation communities. In attempting to protect

them from fire, some have been made more vulnerable to being lost to fire. Some communities are more extensive due to their ability to establish and persist in undisturbed areas. With continued protection from fire, some species dependent on fire disturbance to persist may cease to be found in the analysis area. Fire disturbance is necessary in order to maintain a wide variety of vegetative communities, species, and seral stage diversity.

With frequent fire disturbance, mixed conifer communities were maintained with light fuel loadings (Fuel Models 8 and 9). With fire exclusion, these communities have been allowed to accumulate high fuel loadings (fuel model 10). These communities were historically maintained with frequent low to moderate intensity fires. To continue to maintain these communities, it is important that they be treated i.e., underburned. Areas modeled as Fuel Model 10 tend to correspond with areas of late-successional habitat. Many areas of late-successional habitat have accumulated high fuel loadings and are modeled as having high fire behavior potential. These factors impact the health of stands by increasing stand densities, inner tree competition, and reducing the ability for early and mid-seral trees to grow larger, and the ability of larger trees to survive large-scale fire disturbance.

Some very important wildlife habitats are found in the analysis area, along with private residences and other Forest investments. In order to enhance and protect these important features, the development of a coordinated system of natural and managed shaded fuelbreaks was identified in the Klamath National Forest, *Forest-Wide LSR Assessment* (1999) as a first step.

As part of the development of the Access and Travel Analysis portion of this analysis (Appendix E), some roads that could be utilized for developing these shaded fuelbreaks have been identified, as well as other roads and ridges that are important for fuels treatment and fire suppression efforts. Once developed, this system can be used for fire suppression and for implementing fuels treatment activities that use prescribed fire, along with other types of fuels removal, to protect important features now found in the area and to develop desired conditions. See Figures 6-2 and 6-3 for Fire and Fuels Treatment Opportunities, contained in the Map Packet located at the end of this document.

---

---

**Key Question #2 - What is the desired role of fire in the analysis area and how can fire be incorporated as an ecological process and meet standards for smoke management?**

---

---

One of the highlights from the *Forest Plan* is "an aggressive Fuel Management Program treating about 27,000 acres per year will reduce fuels with the intent that future fires will be less intense and less destructive. A primary objective of the Fuel Management Program is to allow fire to play its regulating role in the ecosystem. Prescribed fire and Prescribed Natural Fire (PNF) will be emphasized. PNF will be used in Wilderness, the larger LSRs and in Backcountry." (*Forest Plan* Pages 3-18, 3-19) Through this analysis, we have defined the desired role of fire as a natural ecological process that has the ability to: control vegetation density and fuel loadings; maintain vegetation communities in conditions that are more resistant and resilient to the effects of high intensity disturbances; reduce the probability of a large catastrophic fire occurrence; promote vegetation species diversity; enhance and maintain disturbance-adapted plant species; enhance and maintain important wildlife habitats; and protect private residences and important investments. In response to *Forest Plan* goals and objectives, the Forest can implement fuels treatment projects within the analysis area. The 27,000-acre Forest-Wide target equates to approximately 1,450 acres of prescribed fire per year in this analysis area. In addition to this, there is also an opportunity to allow natural ignitions to burn in Wilderness and Late Successional Reserves.

This analysis has identified fire as a tool which if utilized can develop and maintain desired conditions. High and moderate severity wildfire is a threat to current and desired conditions. Managed fire in this analysis area by itself and/or in conjunction with other vegetation management can be used to develop and maintain desired conditions. Large-scale catastrophic wildfire, on the other hand, will setback the development of these same desired conditions.

Managed fire will cause some small-scale detrimental effects, but these effects will be short lived and the long-term benefits far outweigh these short-term small-scale effects.

Following is a quote from the Thompson Ridge Fire History Study (Taylor and Skinner 1996) regarding late-successional habitat: "The cumulative effect of fire severity variation across slopes suggests that forests with late-successional characteristics (e.g., multi-layered canopy, high density of large diameter trees, snags, coarse woody debris) were more commonly found at lower slope positions as well as on north and east facing slopes.

Upper slope positions as well as intermediate positions on south and west facing slopes were more likely to display a pattern of scattered, remnant, older trees and patches, exhibiting some late-successional characteristics within a coarser-grained pattern largely of younger stands. Managers designing activities to reduce the likelihood of large, severe fires (e.g., prescribed fires, thinning, fuelbreaks) while still providing for long-term, late-successional conditions in the LSRs may find it advantageous to pattern the severity and extent of treatments after these historical patterns of severity." Based on the results of the Taylor and Skinner study a map of fire return intervals has been developed. See Figure 6-3 Fire Return Intervals.

Survey and Manage requirements are currently increasing costs and causing severe delays in implementing projects, and also with the discovery of any species, reducing the size of project areas. The Forest needs to challenge the scientific community that single species management approaches are not appropriate outside of laboratory settings. The Forest is managing one of the most diverse areas for flora and fauna in the world. This diversity developed with the influence of frequent fire disturbance. To attempt to remove this disturbance threatens the existence of these disturbance-dependant species.

Fire suppression and fuels organizations are at a historic low, and the Forest's budget is expected to decline further. An area likely to be reduced as budgets decline will be fire prevention personnel. Reductions in fire prevention causes less compliance with fire prevention regulations, and a probable increase in human-caused fires, loss of private residences, and greater threats to human life by fire. Detection (the number of lookouts) will likely be cut with budget declines, allowing fires to burn longer and become larger prior to suppression action. Mortality and heavy fuels buildup, combined with fewer prevention personnel, lookouts, and suppression forces, will inevitably allow more fires to escape initial attack. These fires will destroy wildlife habitat, commodities, and contribute to erosion and increased sedimentation to stream channels on both public and private lands.

To meet air quality objectives, prescriptions for fuels treatment (underburning) include weather parameters that are favorable for smoke to quickly disperse from residential areas and view sheds in the analysis area. This is one advantage of using prescribed fire over wildfire to meet desired conditions. Managers should try to avoid burning under a stable air mass (inversion). Temperature inversions are common in the analysis area during late evening and morning hours. Burns should be timed so that the majority of smoke generated is transported out of the area during afternoon hours. Prescriptions can be

developed that will avoid extended periods of smoldering. Large-scale wildfire events will not meet air quality guidelines. Temperature inversions and long-term smoldering will work together under a stable air mass to hold smoke and particulates within the analysis area for long periods. Depending on size and timing of the fire event, this could last from several days to months.

---

---

**Key Question #3 - What type(s) of fuels treatments have been done in the analysis area and how successful have these projects been in meeting objectives?**

---

---

Within the analysis area 8,054 acres have been harvested and had activity fuels treated. Most of the area harvested (5,856 acres) were clearcut harvested. For the clearcut units the fuels treatment objectives were for site preparation (providing open ground for planting) and for hazard reduction. The fuels treatment objectives for clearcut units were most often met using broadcast burning and were very successful in removing fuels and creating open areas for planting.

Partial cut harvest units have been done on 2,198 acres in the analysis area. All of the partial cut units with the exception of those harvested in 1999 have been treated. Treatment of partial cut units has involved piling of slash and burning the piles during wet weather so as to only remove the fuels that were piled. This has been effective in meeting objectives for removing smaller fuels, leaving large fuels and the remaining stand of trees undisturbed, but is very expensive, labor intensive, and time consuming. Some use of underburning has been done through partial cut units with good success in meeting objectives. The results of some of this underburning have been controversial, due to mortality of some of the remaining overstory. For the most part objectives were met by underburning through these units.

In recent years underburning has been done through natural stands for fuels reduction and wildlife habitat improvement objectives. These have been very successful in meeting objectives. Currently, areas that have been underburned (both partial cut and natural stands) display low fire behavior potential.

---

---

**Key Question #4 - What is the desired relationship with private landowners in regards to fuels treatment?**

---

---

It is important that the Forest Service maintains good relationships with private landowners (residents and industrial landowners) within the analysis area. Fuels treatment has been controversial within the area, due to

smoke impacts, concerns for possible escapes, and damage to water sources or improvements. The Forest Service needs to work with private residents especially to help educate and resolve their concerns about burning. It is for benefit of residents as well as forest health, wildlife, fisheries, recreation, etc. That the underburn program continues to expand.

The largest industrial landowners (Timber Products) have expressed that they would prefer not to have their lands burned. Fruit Growers Supply Co. has expressed that they would be willing to work with the Forest Service to utilize natural breaks for underburning. For burning next to boundaries with Timber Products, it may be possible to utilize fuel breaks that are already in place

### DESIRED CONDITIONS

The use of fire will likely be an integral component of management plans that successfully provide long-term, late-successional conditions in the newly established LSRs of the Klamath Mountains (Taylor and Skinner 1996).

- Stand conditions that don't promote high severity fires.
- Disturbance-adapted mixed conifer communities are maintained/increased.
- Fire-adapted plant species are maintained in the analysis area.
- Area is more resilient to catastrophic fire and drought disturbances.
- Fire plays a natural role allowing for development and maintenance of late-mature/old-growth stands.
- Management activities consider and are consistent with overall fire management strategies.
- A diversity of seral stages similar to pre-settlement conditions are maintained across the analysis area. This mosaic of moderate and small patches will provide habitats for the variety of wildlife that use the analysis area.
- Poor sites, which are mostly hot and dry and for the long-term can only support shrubs, are managed for wildlife values. These areas are important deer and elk winter and spring range.

--In LSRs and RRs where vegetation communities are mixed conifer and/or true fir, are managed for the maintenance of 50-75% of these stands with large tree character (mid/mature, old-growth). This is in line with natural conditions of the vegetation types in the analysis area.

--Conifer plantations growing on good sites in this watershed are protected from catastrophic fires. These same plantations are managed to promote tree growth and make them more resilient to fire. This will provide future mid/late-seral habitat and also commercial timber.

--A viable system of shaded fuel breaks (including ridge-top roads) is established and maintained throughout the analysis area. This system can be utilized for both fire suppression and fuels treatment activities.

--Reduce the severity/change the fuels profile to be conducive with historic vegetative patterns. Increase stability and diversity.

--Loss of mature forest cover to wildfire would be unusual.

--Plantations are put into a fire-stable condition.

--Human residents, their homes, and property are safe from the effects of wildfire.

<b>suppression access</b>	under private, state or county jurisdiction and all ML 3, 4 and 5 roads and ML 2 roads on ridges or with main access	roads that provide primary access or better access than alternate routes.	roads that are not needed for primary access.
<b>ACCESS NEEDS:</b>	<b>Ratings: H, M or L *</b>		
<b>Criteria</b>	<b>H</b>	<b>M</b>	<b>L</b>
<b>Prescribed fire access</b>	All Forest Service ML 3, 4 and 5 roads and ML 2 roads on ridges or with main access	ML 1 and 2 roads that provide access for prescribed fire mgmt. and/or are strategically located for potential fuel-breaks.	ML 1 and 2 roads that are not needed for prescribed fire access or use.
* <b>H</b> = High need for open and maintained road, <b>M</b> = Moderate need for open and maintained road, <b>L</b> = Low need for open and maintained road <b>ML=road maintenance level.</b>			

### Key Question #5 - What is the desired road system for fire suppression and fuels treatment activities?

--A road system that provides access for fire suppression and prescribed fire. These roads are utilized as control features for prescribed fire. During this analysis the terrestrial subgroup identified roads that were important for fire suppression and fuels treatment access and those that could be utilized as fuel breaks. Table 5-14 Terrestrial Road Rating Criteria, describes the criteria used by this subgroup for rating roads within the analysis area.

<b>Table 5-14 Terrestrial Road Rating Criteria</b>			
<b>ACCESS NEEDS:</b>	<b>Ratings: H, M or L *</b>		
<b>Criteria</b>	<b>H</b>	<b>M</b>	<b>L</b>
<b>Fire</b>	All roads	ML 1 and 2	ML 1 and 2

### Late-Successional Habitat

#### Key Question 1- How has the amount, distribution and condition of late-successional habitat changed across the analysis area?

#### Key Question 1a- What have been the agents of change?

Late-successional forest habitats are naturally diverse within the project area. Historically, the distribution and condition of forest habitats were shaped by disturbance processes, such as weather events and/or fire. The natural fire regime had direct and indirect effects on species composition and species abundance. Prior to the influence of European settlers, it is expected that the landscape was patchy, containing a variety of different age and size classes in the forested communities. Large-scale fires were infrequent, while frequent low-to-

moderate fires broke up the larger patches of forest and maintained fuels at a sustainable level. Dense, late-successional forest habitats were found along drainage bottoms, on the lower portions of north and east aspects, and in higher elevation true fir types (refer to Fire discussion). More open stands of late-successional forest (consisting of pine or pine/mixed conifer) occurred on south and west aspects. According to early accounts, scattered conifers and hardwoods with chaparral, grasses, and forbs in the understory covered south and west aspects.

During the late 1800s and early 1900s, frequent burning by local residents had a profound effect on the local fire regime by maintaining early successional vegetation in openings, maintaining open understories, excluding fire-intolerant species (such as white fir), and maintaining lower levels of ground fuels. Fire exclusion became policy for National Forests shortly after the turn of the century, but didn't have much effect until the 1940s when suppression efforts were mechanized after the war. Effective fire suppression since that time has changed the distribution and structure of late-successional forest by allowing stand densities to increase, allowing the understory to fill in with shade tolerant conifer and hardwood reproduction, increasing the buildup of fuels, promoting development of ladder fuels, and promoting development of closed canopies that can sustain crown fire. With this change in stand structure, fire suppression has also allowed for the development of more dense forested stands on south and west aspects, and higher on slopes, where historically stands were much more open.

Changes to forested stands over the last century have lead to large landscape-level fires burning with varying degrees of intensity across the Forest. These wildfires have reduced and fragmented late-successional forest in the landscape. Large fires occurred adjacent to the analysis area in 1955 and within the analysis area in 1987; the fires of 1987 burned 8,790 acres in the Lower Scott Watershed.

Forest management activities have also influenced late-successional forest habitats in the analysis area. Timber harvest and road building have accounted for most of the management that has impacted vegetation and influenced the amount of late-successional habitat currently found today. Roughly 8,650 acres (10% of the analysis area) of forested land have been cleared through timber harvest since the 1930s. In addition, there are approximately 236 miles of roads within the analysis area. Clearing through timber harvest and road building has reduced the amount of late-successional habitat and fragmented larger blocks of habitat.

Areas that have been harvested in the matrix will be managed for forest health, maximum tree growth and yield, and future commodity outputs. Within LSRs, areas that have been harvested will be managed for development of late-successional forest habitat that will persist over time. It is not expected that LSRs will consist of homogeneous stands of late-successional forest, rather it is expected that the landscape will contain a mosaic of seral stages and structural components as described below under Key Question #2 - Desired Conditions.

Many of the features that make late-successional habitat suitable for late-successional forest-related species also make it susceptible to catastrophic loss from wildfire or pest epidemic. Large downed wood, dense canopies, and understory vegetation all contribute to habitat suitability and to high fire behavior. The higher stand densities on south and west slopes, resulting from fire suppression, leave them susceptible to mortality from inter-tree competition, insect epidemic, and loss to fire. Treatments to reduce fire risk, such as reducing continuity of canopies, removing ladder fuels, and reducing ground fuels, may reduce the quality of habitat for late-successional forest-related species. Therefore, within LSRs it is important to seek balance in an approach that reduces risk of fire while at the same time protects large areas of fire-prone late-successional forest.

Currently, there are 32,930 acres of late-successional forest habitat within the analysis area (57% of the capable land). It is estimated that dense late-successional forest occupied roughly 40,930 acres of the area in the early part of this century, based on historic logging (71% of capable land), with the remainder of the capable land in a variety of seral stages or open conifer stands influenced by natural processes. Using these acreage figures, dense, late-successional forest habitat has been reduced by roughly 14% since the 1930s. The overall distribution of late-successional forest is similar to historic patterns; however, larger stands of forest have been fragmented by wildfire, timber harvest, fire salvage, and roads. Average patch size has decreased, and there has been a loss of large diameter trees, especially in the pine/mixed conifer zone. Within LSRs, late-successional forest has been reduced by approximately 18% of capable ground within this analysis area.

---

---

**Key Question 2- What is the desired condition of late-successional habitat within LSRs and across the watershed?**

---

---

The desired condition for late-successional forest habitat focuses on reserves (LSRs) that have been set aside for

the purpose of maintaining and enhancing late-successional forest habitat and other land allocations that are expected to provide dispersal for late-successional forest related species across the landscape (100-acre LSRs, RRs, and special habitat areas). The desired conditions described here have been adapted from the Forestwide LSR Assessment (USDA 1999).

The desired condition within reserves and special habitat areas is to provide late-successional forest in which structure and composition is consistent with site conditions and ecological processes. Important structural attributes include live old-growth trees, standing dead trees, fallen trees or logs on the forest floor, and logs in streams. Additional important elements typically include multiple canopy layers, smaller understory trees, canopy gaps, and patchy understory. These conditions typically begin to appear when forest stands are between 80 and 140 years in age, depending on site conditions, species composition, and site history.

A generalized desire for LSRs is to promote and maintain late successional conditions in the maximum amounts sustainable through time. Processes that historically have created late-successional ecosystems include: tree growth and maturation; death and decay of large trees; low to moderate intensity disturbances (such as fire, wind, insects and disease) that create canopy openings and gaps in the vegetation; establishment of trees beneath the maturing overstory trees either in gaps or under the canopy; and closing of canopy gaps by lateral growth or growth of understory trees. These processes result in forests moving through different stages of succession that may span several hundred years.

It is desirable to have variability in late-successional vegetative characteristics across the analysis area. Multistoried conditions will be scattered throughout the landscape, but will be more prevalent on the lower half of the more mesic north and east aspects, and in riparian areas. South and west facing slopes will have fewer multilayered conditions and potentially different species composition. Canopy closure will vary across the landscape, ranging from less than 50% on south and west slopes to greater than 80% on north and east slopes and riparian areas. Upper portions of all aspects, except in the true fir type, will generally have lower densities as compared to lower on the slopes. Snag and down log accumulations will be higher on the lower portions of slopes and decrease as one moves up slope.

It is anticipated that plantations are capable of supporting mature and late-successional forest, and therefore, the desired condition is to manage them over the long term to produce late-successional forest. Residual snags,

hardwoods, and down logs from the previous stand will be desired components to maintain within these plantations. Hardwoods should be carried through the life of the stand. In the interim, the stands should be healthy and fast growing with stocking levels and fuel accumulations that reduce the likelihood of loss to catastrophic fire.

The introduction of prescribed fire into late-successional forest stands will help encourage the processes and attributes that define late-successional ecosystems. It is expected and even desirable to have low to moderate intensity fires burn in LSRs and RRs. Low intensity fires will reduce fine fuels and ladder fuels, create a seedbed for a diversity of herbaceous plants, and create a patchy understory. Moderate intensity fires are desirable if they create small openings in the canopy of one to five acres in size. This allows for regeneration of forest stands and creates snag patches and concentrations of down woody debris, which are important habitats for some late-successional forest-related species. Burn openings are most desirable if they occupy only a small percentage (5-10%) of the stands providing habitat. In addition, the introduction of a fire cycle more similar to that which occurred in pre-suppression times will reduce the risk of catastrophic fires. Large, stand-replacing, high intensity fires are not desirable within reserves or special habitat areas. Throughout the area, fuel conditions should generally range from low to moderate fire behavior. Variability of fuel conditions across the landscape is desired, with some high concentrations of fuel (coarse woody debris - CWD) intermixed with areas of low fuel accumulations. It is reasonable to expect that heavier scattered pockets of fuels (CWD) will occur on relatively cool, moist sites, such as those found on north and east aspects, or low on the slope adjacent to perennial riparian areas. South and west aspects and upper slope positions, which are typically drier and harsher, will generally contain lighter fuel loadings with fewer scattered pockets of heavy fuel. Site capability will also influence the amount of fuel or CWD.

It is desirable to continue to have insect and disease populations at endemic levels within late-successional forest habitats. Insects and diseases create gaps and are important for creating many of the decadence attributes desired in old-growth stands. It is important that they don't reach levels that will create situations that will prevent the long-term sustainability of late-successional habitats.

In addition to the general desired conditions described above, the following are aspect and site-based desired conditions that have been identified in the Late-Successional Reserve Assessment (USDA 1999). They

are intended to be employed once it has been determined that a treatment (thinning, prescribed fire, etc.) is warranted within one of the two LSRs in the analysis area (refer to Step 6 - Management Recommendations and Figure 6-4). The descriptions are to be used to guide the development of the prescriptions at the project-level, with development and maintenance of late-successional habitat as the ultimate objective of the treatment. For more specific, project-level information on desired basal area in stands, desired number of snags, amount of downed wood, and number of trees, refer to the LSRA Chapter 3 (USDA 1999).

#### **Mixed Conifer on North and East Facing Slopes:**

Late-successional forest conditions will be structurally diverse. It is desirable to have dense stands with total canopy closure greater than 60% and tree species best suited to the site conditions. Due to the nature of the steep slopes and associated fire behavior, canopy closure should be less on the upper 1/3 of the slopes. Canopy closure of 40 to 60% would be more common on the upper slopes. This condition should not be uniform across the landscape as variability is important. Patches of denser stands should still be intermixed with the more open stands on the upper slopes. Decadence should be present or even obvious; snags and coarse woody debris would be common, although in varying concentrations throughout the stand. Deformed, broken and diseased trees would also be common enough to provide nesting and roosting opportunities for wildlife. There will be gaps created by natural mortality where early seral vegetation is present. Due to the nature of the aspects, fuel accumulations may be higher than those found on the south and west slopes. Pockets of higher fuel concentrations may be more frequent. Conifer species should contain a mixture of Douglas fir, white fir, ponderosa pine, sugar pine, and incense cedar. Dominant hardwoods should be black oak, madrone, and maple.

#### **Mixed Conifer on South and West Facing Slopes:**

Late seral conditions will be structurally diverse. These stands will generally be more open grown with canopy closure ranging from 40 to 60%. Decadence, stand structure, and CWD would be similar to that described above for north and east slopes. Pockets of high fuel concentrations will be less frequent than those found on north and east aspects. Pockets of high fuel concentrations should be located lower on the slopes where it is cooler and moister. These sites will contain vegetation that is dominated by conifers. Hardwoods will be present in the stands. Due to the fire behavior on steep slopes, the upper 1/3 in some locations may have canopy closure as low as 25%. The stands will be single layered with some hardwoods present in the understory. Stands of different ages will be scattered over the landscape on

these aspects, but a majority of the stands will contain late mature to old growth characteristics. Ponderosa pine will be the dominant conifer species, but will be intermixed with Douglas fir, sugar pine, and incense cedar. Hardwood species will consist of black oak, madrone, and canyon live oak.

**True Fir Sites, Any Aspect:** At elevations above approximately 5,000 feet, the vegetation changes from a mixed conifer to true fir. Species will be dominated by white fir, but red fir will be found as a secondary species. Stands will be dense with crown closures greater than 60% on north and east aspects, with less dense stands on south or west aspects. Stands will generally be single layered stands with very little understory present. Decadence will be present in most of the stands. Snags and down logs will occur scattered and/or concentrated in clumps.

#### **Sites Not Capable of Growing Dense Mixed Conifer Stands:**

These stands will be open, with 10-50% total crown closure. Many of the stands will be dominated by canyon live oak, montane chaparral, black oak, and/or ponderosa pine, with scattered madrone and conifers. Overstory conifers will be ponderosa pine and Douglas fir. Conifer density will range from 1-10 per acre. Snag levels will generally be between 1-2 per acre and down woody debris averaging less than 5 per acre.

---

---

### **Key Question 3- How will connectivity of late-successional habitat be maintained within and between LSRs?**

---

---

Connectivity between LSRs, and between LSRs and wilderness, in the analysis area is considered good for two reasons. First, the distance between the two LSRs and between the Seiad LSR and wilderness is less than 6 miles, giving it a "very strong" rating in the Forestwide LSRA. Second, the Lower Scott Watershed has more than 50% of capable ground in dispersal habitat (average diameter at breast height of 11 inches and average crown closure greater than 40%), putting it below the threshold for formal consultation on projects that will remove or degrade habitat for northern spotted owls (USDA 1999) (refer to Table 3-31 Dispersal Habitat Between LSRs and Wilderness Within The Lower Scott Analysis Area). Given these two methods of rating, connectivity between reserves in the area is determined to be good.

Maintenance and/or improvement of existing connectivity between large reserves will be achieved through project planning that maintains more than 50% dispersal habitat

in the watershed, through road decommissioning in areas with high road density, through maintenance of RRs and 100-acre LSRs, and through management of plantations and burned areas to promote growth of mature trees.

Connectivity of late-successional forest within the Lower Scott portion of the Seiad LSR is lacking. The wildfires of 1987 and subsequent salvage logging reduced late-successional habitat on over 2000 acres in the Tompkins Creek drainage. The desired condition for this LSR is to promote the growth and development of late-successional habitat over time. Management of forested stands in this area should focus on treatments that will accelerate growth, reduce fuels, reduce competition, and protect the stands so that they can develop into late-successional habitat.

Overall distribution of late-successional habitat in the Collins-Baldy LSR is weak. Dense, mid-successional and pole stands dominate the LSR. These mid-successional and pole stands may provide some connectivity, however, dense stand conditions, high fuel levels, and conditions on adjacent private land reduce the effectiveness of the habitat for late-successional forest related species. Management of habitat in the Collins-Baldy LSR should focus on stocking control and fuels reduction. Protection and management of these stands is critical to the development of late-successional forest in this LSR. Connectivity of late-successional habitat across the LSR will continue to be limited due to the checkerboard ownership pattern. Management should focus on a mosaic of late-successional forest which includes larger patches on public lands (square mile sections) and expect smaller patches and clumps of residual trees on private land (spotted owl protection zones, riparian buffers, and other special management areas).

In order to maintain connectivity within and between large reserves, it is important to consider the potential for catastrophic loss of habitat through fire or disease. High stand densities and large amounts of ground and ladder fuels indicative of fire exclusion increase the risk of wildfire and insect epidemic. Thinning of dense stands and utilizing prescribed fire to reduce fuels will aid in maintaining existing habitat connections across the landscape.

#### **Riparian Reserves**

Approximately 9,550 acres of RRs occur within the analysis area. Riparian Reserves that have been identified in this analysis as important for connectivity between LSRs (see Step 3) include Bill Berry Creek, Muck-a-Muck Creek, George Allen Gulch, McGuffy Creek, Wooliver Creek, Pat Ford Creek, Hossick Gulch, Big

Ferry Creek, Little Ferry Creek, Kelsey Creek, Canyon Creek, and Boulder Creek.

Management activities and disturbance events reduced late-successional habitat within riparian corridors prior to the designation of RRs. Approximately 859 acres of plantations exist within RRs. Thinning and fuels reduction in those stands would accelerate development of late-successional forest habitat for movement and dispersal of late-successional forest related species.

Major flood events in 1964 and 1997 have also set seral stages back in larger drainages, such as Canyon Creek, Kelsey Creek, and Tompkins Creek.

Habitat condition trends within RRs are toward later successional stages in the upland forested areas and a variety of stages in riparian/wetland areas dependent on hydrologic processes and events.

Desired conditions for RRs are described in the Forest Plan. Generally, for the analysis area, desired conditions include a diversity of vegetative structure with later structural stages of vegetation in the conifer zone and a mix of seral stages in the riparian/wetlands.

---

---

#### **Key Question 4 - How will the effects of high road density on late-successional habitats be minimized?**

---

---

##### **Key Question 4a - What are the criteria used to assess roads for the Access and Travel Analysis included in Appendix X of this document?**

---

---

Road construction in the Lower Scott Analysis Area was generally done to access timber harvest areas or mining claims. Road building opened up areas to higher levels of human use through recreation, hunting, or collection of forest products. Human access has effects on wildlife by providing a source of disturbance, which can reduce the effectiveness of the habitat. It also provides access to once remote areas, which can cause an increase in the illegal harvest of wildlife. Roads also permanently alter habitat within the roadway itself, they divide larger blocks of forest into smaller fragments, which impacts species of low mobility by splitting habitat and making portions of the habitat inaccessible.

Impacts to late-successional habitat and disturbance to wildlife populations can be minimized by closing roads, thereby eliminating disturbance from motorized vehicles and reducing access, or by closing/decommissioning

roads and allowing the roadbed to be recolonized by the local vegetation or replanted.

Land allocations, such as LSRs and RRs, have management goals/objectives where commodities and logging are not the primary land use. The reserves are established to protect, enhance and restore habitats and ecosystems. Portions of the current road system are not consistent with these land allocations and have been reviewed as part of this ecosystem analysis. Refer to Appendix E - Access and Travel Analysis, which provides a starting point for developing road improvement, maintenance, and decommissioning opportunities.

The road network within the analysis area was assessed for effects on late-successional forest habitat and deer/elk range using road density criteria as displayed below in Table 5-15. These criteria were used to rate each road within the analysis area, combined with criteria from other resources including human use, as described in Appendix E Access and Travel Analysis. Areas rated as "high resource impacts associated with roads" (see below) were highest priority for road closure or decommissioning in order to reduce disturbance and/or reduce habitat fragmentation in those areas most heavily impacted.

**Table 5-15, Terrestrial wildlife road rating criteria for the Lower Scott Analysis Area.**

RESOURCE IMPACTS: Ratings: H, M or L			
Criteria	(H) - high resource impacts associated with roads*	(M) - moderate resource impacts associated with roads*	(L) - low or negligible resource impacts from roads*
<b>Reduce road density in LSRs</b>	Areas within LSRs with >4 miles per sq. mile of roads	Areas within LSRs with 1-4 miles per sq. mile of roads	Areas within LSRs with < 1 mile per sq. mile of roads
<b>Reduce road density in deer/elk range (winter, summer, transitory)</b>	Areas within deer/elk range with >4 miles per sq. mile of roads	Areas within deer/elk range with 1-4 miles per sq. mile of roads	Areas within deer/elk range with < 1 mile per sq. mile of roads

**Site Specific Criteria:** 1) Roads that access plantations, that have been identified for closure within LSRs, should be considered for gating to allow access for thinning of plantations, decommissioning should be planned for the future. 2) Roads that intersect blocks of late-successional habitat within LSRs should be considered for decommissioning in order to reduce fragmentation of late-successional forest habitats. 3) Maintenance level 1 and 2 roads within 1/2 mile of bald eagle or peregrine nests should be considered for closure.

**\*Road density ratings are based on total road density for system roads, including roads with seasonal or year-round closures. Therefore, open-road related disturbance is less than is implied by the above density ratings.**

- Road densities are reduced to an average of less than two miles per square mile within LSRs.
- Road densities in the matrix are reduced to less than four miles per square mile where possible.
- Roads in the vicinity of known nest sites or important habitat areas are closed.
- Fragmentation of late-successional habitat is reduced by decommissioning of roads in areas that exceed four miles per square mile.

---



---

**Key Question 5 - What are the implications of private land management adjacent to LSRs as it relates to managing for late-successional forest related species across the landscape?**

---



---

Land management emphasis on privately owned land is long-term management of timber lands, using even and uneven-age management, for maximum production of high quality forest products while maintaining and enhancing other forest resources such as water quality and wildlife habitats (C. Brown and S. Farber, pers. comm. 1999). The goal of this management process is to maintain functional spotted owl habitat while growing and harvesting a sustainable yield of forest products. The strategy of maintaining structural features, such as snags, green cull, downed logs, and clumps of residual trees, is expected to provide for the long-term stability required for the conservation of the northern spotted owl.

Currently, within the Forest boundary, there are roughly 13,900 acres of private land; 28% of that is in a late-successional forest stage, 61% is in a mid-successional stage, and 11% is in an early successional stage. Timber harvest on private land is expected to reduce late-successional habitats and promote early and mid-successional stages of forest habitat. Habitats on private land will consist of a mosaic of younger, harvested stands with clumps of large trees and patches of older forest in known spotted owl activity centers, in riparian buffers, and in other special habitat areas. It is expected that dense late-successional habitat will be reduced over time on private lands except in known spotted owl activity centers. Private lands will provide foraging and dispersal habitat for late-successional forest related species, but those species will rely on public lands for larger patches of mature forest for nesting and denning.

## Terrestrial Wildlife

### Desired Conditions

Key Questions for wildlife have been combined and will be answered together for each species.

---

---

**Key Question #1 - For these wildlife species, what has changed from historic to present and what have been the agents of change?**

**Key Question #2 - What are the expected future trends for these wildlife species?**

**Key Question #3 - What are the desired conditions for these wildlife species and their habitats?**

**Key Question #4 - Are there any management implications with regards to wildlife populations and habitats?**

**Key Question #5 - What are the effects of exotic species on the ecosystems within the analysis area?**

**Key Question #6 - How will the effects of high road density on wildlife species be minimized?**

---

---

**Bald Eagle:** Suitable habitat along the Scott River and its tributaries has remained fairly constant over time, with some reduction in nesting and roosting habitat along the river (mining, road building, and logging) since historic times. Foraging opportunities along the Scott River and the larger creeks have decreased with lower numbers of salmon. Without specific data on historic numbers of bald eagles, it is assumed that there were more nesting bald eagles in the area prior to European settlement than there are now. Currently eagle populations are on the increase from lowest population levels in the 1970s due to their protection under the ESA and the restrictions on use of pesticides such as DDT (Dichloro-diphenyl-trichlorethane). The carrying capacity of the habitat within the analysis area is unknown. It is expected that the area cannot support more than one, or possibly two, nesting territories due to limited low gradient reaches of the River characteristic of nesting/foraging areas.

#### Trends

- It is expected that there will be a healthier and larger bald eagle population on the Forest, but with only one or two nest territories within the analysis area.
- Winter use of habitats along the Scott River will remain the same or increase.
- Protection of late-successional forest within RRs, LSRs, Recreational River and Scenic River designations will ensure adequate nest and roost sites.
- Recovery efforts for anadromous fish are expected to increase foraging opportunities along the Scott River.

#### Desired Conditions

- There are late-successional forest conditions, with large trees/snags for nesting and roosting, along the Scott River and within RRs with emphasis on large pines and low to moderate fuel loading.
- Future nest sites have limited or no road access with minimal disturbance from humans.
- There are only low levels of disturbance from recreationists around future nest sites.

**Northern Spotted Owl:** The change in frequency and severity of fires through effective fire suppression over the past several decades has had an effect on the structure of suitable spotted owl habitat. Mixed conifer forest in the analysis area has become denser with multi-layered stands, larger numbers of shade-tolerant species and accumulations of ground fuels. Understory trees and shrubs have encroached into normally more open stands (e.g. south and west aspects) due to the lack of ground fires. This change to forest structure is creating a condition that will most likely lead to large stand-replacing fires similar to those already experienced during 1987. The continuous accumulation of small surface fuels, vertical fuels, and large woody material have created a situation in which crown fires will occur with greater frequency and fires will be larger and far more destructive of suitable habitat. In order to reverse the trend, fire would have to be reintroduced into the landscape. Fuels reduction efforts would have to be focused on areas where fuels were naturally lower, such as south and west aspects and higher on slopes.

It appears that the amount and distribution of conifer vegetation has changed in this analysis area as fire exclusion has allowed conifer growth or encroachment into other plant communities. It also appears that the amount of suitable spotted owl habitat (dense late-successional forest) has decreased overall as a result of timber harvest, fire salvage, and road building. Currently, within the analysis area, there are 28,028 acres (including private land within the Forest boundary) of suitable nesting, roosting, and foraging spotted owl habitat (refer to Table 3-32, Suitable Spotted Owl Habitat by Management Area); this is roughly a 22% reduction in habitat since the 1930s based on historic logging. Of the habitat that has been affected by timber harvest and road building in the analysis area, approximately 30% is located within large LSRs. Current management direction in LSRs calls for the protection and enhancement of late-successional forest within LSRs. Given this direction, the long-term objective in this analysis area is to develop previously logged and roaded areas within LSRs into late-successional habitat suitable for northern spotted owls. There are approximately 2,400 acres of previously

harvested land that can be developed into suitable habitat over the long-term. In addition, as a result of fire suppression, there are large areas of dense, early and mid-successional habitat that are at risk of loss to wildfire, insects or disease. Thinning and fuels reduction in dense stands will increase growth and development of late-successional forest characteristics while protecting stands from loss to wildfire or insect epidemic.

Surveys for spotted owls within the analysis area have been ongoing since the 1980s (refer to Table 3-33, Spotted Owl Survey History for the Lower Scott Watershed). Current surveys, as defined by the most recent protocol, have been conducted in the Canyon Landscape, Scott Bar Mountain, parts of the McGuffy Creek drainage, and much of the Collins-Baldy LSR (private survey crews). The current population, based on the surveys, is approximately 25 activity centers. It is expected that the number of identified activity centers represents the population potential for the analysis area outside of wilderness; the wilderness has not been fully surveyed and may contain additional owl pairs. The locations of activity centers may change over time but the number is expected to remain fairly constant. Over the long term, as late-successional habitat develops in areas that were burned in 1987 (Tompkins and Deep Creeks), additional activity centers may be identified. Natural vegetation patterns, disturbances, fire exclusion, recent timber harvest, and road building have contributed to the current distribution of owls.

**Critical Habitat** - Spotted owl Critical Habitat overlaps the two LSRs within the analysis area by 98% (100% overlap in Collins-Baldy, 97% overlap in Seiad). Approximately 422 acres of Critical Habitat occur in the Matrix, adjacent to the Seiad LSR, within the Lower Scott Watershed. Of the 422 acres, 37 are defined as suitable spotted owl habitat in the EUI database. None of the suitable habitat is located within a known owl activity center. The portions of Critical Habitat in the matrix are linear and roughly follow, but overlap outside of, the Seiad LSR boundary. The LSR boundaries are located along or near ridge tops and follow fairly obvious topographic boundaries; the Critical Habitat does not follow topographic boundaries. Given the high degree of overlap between the Seiad LSR and Critical Habitat Unit CA-17, the LSR meets the spatial and connectivity intent of Critical Habitat (USDA 1999). Minor adjustments to the Critical Habitat boundaries, aligning them with the LSR boundary, would clarify the management strategy for that area and would streamline management on the ground by using topographic features for the boundaries of both the LSR and the CHU.

#### Trends

- The number of spotted owl activity centers outside of wilderness will remain fairly constant for the near future (30 to 50 years), but may increase by 2 or 3 as habitat develops in previously burned areas (Tompkins and Deep Creeks).
- The amount of suitable spotted owl habitat in LSRs will increase over time, provided there are no large-scale wildfires, as harvested areas and areas affected by fire recover within the LSRs.
- Habitat in the Matrix will fluctuate as cut-over areas within the forest mature and additional areas are harvested. Current methods of timber harvest are not expected to remove large blocks of suitable habitat (clear cuts), partial harvest and patch cuts may continue to provide suitable habitat.
- Dispersal and foraging habitat will increase as cut-over areas within the forest Matrix and in RRs mature.
- Dispersal and foraging habitat (including harvested openings) will occur on adjacent private lands; nesting and roosting habitat will be more limited on private lands.
- Successful fire suppression has created conditions within suitable habitat that have increased the potential for large-scale disturbance events, such as wildfire or disease epidemics; large-scale disturbance would increase the fragmentation of suitable habitat.

#### Desired condition

- Northern spotted owl populations are at or near full potential in the planning area.
- Recovery of spotted owls is promoted or achieved through development and protection of suitable habitats.
- The amount of suitable habitat within LSRs is at the maximum amount sustainable through time.
- Dispersal habitat for owls is provided at 50% of capable ground in the Lower Scott watershed; dispersal habitat is provided within 100-acre LSRs and within RRs.

**Goshawk:** There are eight known goshawk sites within the analysis area; all have been surveyed to some extent with the exception of Canyon Creek (refer to Table 3-35, Goshawk Survey History for the Lower Scott Watershed). Three of the sites have been recently verified by surveys (Boulder Creek, Kelsey Springs and Deep Lake Creek), these sites should be managed according to the Forest Plan, including designation of primary nest zones and foraging habitat zones. The remaining five sites should be surveyed to protocol (2 years) and, if occupied, managed according to the Forest Plan, or, if not occupied, removed from the network.

Goshawks utilize habitat that is similar to the northern spotted owl, including a variety of mature forest types. High canopy closure is desired. They commonly have more than one nest within their territories and use them on a rotating basis. Goshawks forage below the canopy on a variety of mammals and bird species. Within the analysis area, habitat for goshawks is described as similar to that of northern spotted owls; therefore, the discussion of habitat changes over time for spotted owls (above) applies for goshawks. Goshawks, however, are known to use stands that are much more open than those used by spotted owls (e.g., ponderosa pine stands); therefore, changes in stand structure as a result of fire suppression may have more impact on the ability of goshawks to forage under the canopy. This change to forest structure has also created a condition that will most likely lead to large stand-replacing fires and subsequent large-scale habitat loss.

#### Trends

- The amount of late-successional habitat will increase over time as harvested areas and areas affected by fire recover within the LSRs; however, dense stand conditions as a result of fire suppression may preclude the ability of goshawks to forage in dense stands.
- Habitat in the Matrix will fluctuate as cut-over areas within the forest mature and additional areas are harvested. Current methods of timber harvest are not expected to remove large blocks of suitable habitat (clear cuts), partial harvest and patch cuts may increase goshawk foraging opportunities.
- Successful fire suppression had created conditions within suitable habitat that have increased the potential for large-scale disturbance events, such as wildfire or disease epidemics; large-scale disturbance would increase the fragmentation of suitable habitat.

#### Desired condition

- Goshawk populations are at or near full potential in the planning area.
- The amount of late-successional habitat within LSRs is at the maximum amount sustainable through time, more open stands are maintained on south and west aspects through the use of prescribed fire.
- Late-successional and mid-successional forest habitats are provided at 50% of capable ground in the Lower Scott Watershed; suitable habitat is maintained within designated Goshawk Management Areas, 100-acre LSRs, and within RRs.

**Pacific Fisher & American Marten:** Survey data and incidental sightings of fisher in the watershed indicate that fisher populations are well distributed, with the possible exception of the Tompkins Creek area (although there is a

lack of survey data in the Tompkins drainage). American marten, on the other hand, appear to be quite rare in the area. Due to the lack of historical data regarding fisher and marten populations within this analysis area, it is difficult to assess population changes from the historical to the current time period. Information in the literature on changes in fisher and marten populations focus on declines that occurred due to over trapping and logging in the United States and Canada. The literature suggests that California fur resources were so low by the late 1800s, that populations have not yet recovered (CDFG 1992).

There is little information on how trapping and habitat loss have affected populations locally. Logging, road building, and fire suppression have changed the structure of the forest, but suitable habitat is still abundant in the area. The description of habitat changes over time from Key Question #1 (late-successional habitat) and the northern spotted owl discussion (above) also apply to fisher and marten.

#### Trends

- Management for late-successional forest within LSRs, with emphasis on large coarse woody material and snags, will provide for fisher and marten for the long-term.

#### Desired Condition

- Marten and fisher populations are at or near full potential in the planning area.
- Late-successional habitat (denning, resting, and foraging habitat) within LSRs is at the maximum amount sustainable through time.
- Foraging and dispersal habitat is provided in the matrix at 50% of capable ground in the Scott River Watershed; foraging and dispersal habitat is provided within 100-acre LSRs, RRs, and other special habitat areas.

#### **Willow Flycatcher:**

Habitat for willow flycatchers in the Lower Scott Analysis Area consists of riparian strips with willow or alder thickets and small patches of willows or alders in higher elevation montane meadows. Within the analysis area there are roughly 3,800 acres of natural shrub (in the EUI database) that are potentially willow flycatcher habitat. Habitats in the analysis area have been impacted by mining, grazing, homesteading, and to some extent by road building. Hydrologic events, such as floods, remove willow habitat for short periods of time, but willows quickly recolonize suitable disturbed sites.

Limited detection data for willow flycatchers in the watershed makes it difficult to determine if willow flycatchers are nesting in riparian and willow habitats in

the area. There is some indication, from data collected at the Seiad mist netting station and during the landbird monitoring program, that breeding does take place in the area (possibly at higher elevations or in adjacent watersheds), but additional surveys will have to be conducted to verify nesting.

Although livestock grazing in the watershed is considerably less than it was at the turn of the century, riparian shrub habitats may continue to be impacted by cattle grazing in allotments where shrub utilization is high. A high level of browsing on willows was identified in the past in Little Elk, Deep Lake, Big Rock and Red Rock.

A major flood event in 1997 reduced riparian shrub habitat in several larger drainages within the analysis area, such as Canyon Creek, Kelsey Creek, and Tompkins Creek.

Emphasis for willow flycatcher management should focus on protecting and enhancing existing meadows and willow habitat. Use Riparian Reserve guidelines to protect willow stands, reduce encroachment of conifers in existing meadows to maintain desired opening sizes, and maintain or improve saturated, standing or flowing water near potential nesting areas. If it is determined through surveys that nesting is occurring in the Lower Scott Watershed, conduct monitoring of management activities, such as grazing, to determine potential negative effects.

#### Trends

- Management and protection of RRs and implementation of the ACS objectives will improve willow and alder habitat conditions along the Scott River and its tributaries. The amount and distribution of willow habitat will remain dynamic as influenced by hydrologic events (e.g. floods).
- With continued fire suppression, alder and willow patches will continue to expand in upper elevation meadows, and may provide nesting habitat.
- Protection of riparian habitats may lead to an increase in willow thickets and an increase in willow flycatcher nesting habitat. As a result, numbers of nesting birds may increase in the area.
- Livestock grazing that exceeds Forest Plan standards will continue to impact riparian shrub habitats in areas where shrub utilization is high.

#### Desired Condition

- Riparian reserves provide nesting habitat and dispersal corridors across the landscape.
- Breeding and dispersing willow flycatchers are at or near full population potential in the analysis area.
- Bird watching opportunities in the analysis area are identified and promoted.

- Important migratory and dispersal routes along the Scott River are developed and maintained through cooperative management efforts with private landowners.
- Livestock utilization or riparian shrubs is monitored; mitigations, such as fencing or deferred rotation grazing, are used to reduce impacts to habitat.

#### **Western Pond Turtle:**

Incidental sightings of western pond turtles along the Scott River suggest that this species is fairly well distributed, although local abundance has not been determined. Western pond turtles are associated with aquatic habitats and may use upland habitats within 1/4 mile of water for nesting.

The most significant declines in western pond turtle populations in California have occurred in the interior valleys such as the Sacramento Valley and the San Joaquin valley. Declines have been associated with livestock grazing, widespread conversion of aquatic habitats to farmland, reclamation of swamp and overflow land, and dam construction.

Locally, threats to western pond turtles include the following: introduced predators such as bullfrogs; cattle grazing which may result in trampling of emergent vegetation and streambanks; mining which results in siltation and localized flooding; road building near riparian areas; and removal of logs, snags, brush or aquatic vegetation in riparian areas and streams. Survey information is needed in the Lower Scott Watershed to determine population levels and to better understand the extent of local threats to western pond turtles.

#### Trends

- Management and protection of RRs and implementation of the ACS objectives will improve habitat conditions along the Scott River and its tributaries.
- Populations may increase with improved conditions in streams and riparian areas.
- Increasing bullfrog populations may impact turtle abundance or distribution.

#### Desired Condition

- Riparian Reserves guidelines protect aquatic habitats and provide nesting habitat in the adjacent upland.
- Western pond turtle populations are at or near full population potential in the analysis area.

#### **Red Tree Vole:**

Very little is known about red tree voles in the analysis area. Recent spotted owl pellet analysis indicates that red tree voles may occur in the area, however, additional

surveys are required to determine whether the species identified was *Arborimus longicaudus* (Oregon red tree vole) or *Arborimus pomo* (California red tree vole). These species will be better understood and protected as more information about populations, habitat occurrence, and distributions are found through surveys and research.

#### Trends

- It is unknown if red tree voles (*A. longicaudus*) occur within the analysis area, therefore trends for this species cannot be predicted. If red tree voles occur in this landscape, it is expected that habitat will increase over time as harvested areas and areas affected by fire recover.
- Habitat in the Matrix will fluctuate as cut-over areas within the forest mature and additional areas are harvested. Current methods of timber harvest are not expected to remove large blocks of suitable habitat (clear cuts), partial harvest and patch cuts may continue to provide suitable habitat.

#### Desired condition within the range of the species:

- The range of red tree voles in California is clearly defined through surveys and research, definition of the range will determine whether red tree voles occur in the watershed.
- Viable populations of red tree voles occur in suitable habitat with adequate corridors of habitat in the Matrix for dispersal between LSRs.

#### **Bats:**

Very little is known about bats in the analysis area. Detections of several Sensitive and Survey and Manage species have occurred at a mist netting station near Indian Scotty in 1997, however, local distribution and abundance has not been determined. Potential roost and foraging sites, such as caves, buildings, late-successional forest and mine shafts, occur within the analysis area. Caves, abandoned buildings, and abandoned mine shafts will be surveyed or protected as outlined in the Forest Plan. These species will be better understood and protected as more information about populations; habitat occurrence and distribution within the Lower Scott Analysis Area are found through surveys and research.

#### Trends

- Decadence within late-successional forest habitats will increase with continued fire suppression; snags, dying trees and hollow logs will provide additional habitat for roosting.
- The amount of late-successional forest will increase as plantations and burned areas develop.
- Use of Marble Caves by recreationists is expected to increase and disturbance to bats may increase.

- Caves and abandoned mine shafts will remain constant; bat habitat will be protected as per Forest Plan S&Gs.
- Foraging habitat provided by riparian areas may improve as RR guidelines and ACS objectives are implemented. Habitat in riparian areas is dynamic and driven by hydrologic events.

#### Desired Condition

- Undisturbed roost sites, such as caves, abandoned mine shafts, and abandoned buildings, occur within the landscape.
- Forest structure in the vicinity of roost sites is maintained to provide foraging habitat and to limit the temperature fluctuations and intensity of sunlight penetrating caves and mines.
- Caves and abandoned mines known to be occupied by bats (through surveys), but that pose a hazard to the public, are closed using devices which do not preclude use by bat species (e.g., bat gates).
- Late-successional forest habitat is abundant and sustainable in the analysis area. Forested habitats provide adequate numbers of snags, dying trees, and hollow logs for roosting of bat species.

#### **Del Norte and Siskiyou Mountains Salamanders:**

Recent surveys for Del Norte and Siskiyou Mountains salamanders have more clearly defined the range of both species on the Forest. Surveys have also indicated that these salamanders occupy a wider variety of habitats than previously suspected. Within this Analysis Area, it is known that Siskiyou Mountain salamanders occupy habitats east of the Scott River and near the mouth. It is not known at this time if Siskiyou Mountain salamanders or Del Norte salamanders occur west of the Scott River in the Tompkins, Boulder, Kelsey or Canyon Creek drainages. Further surveys will be needed to define the area of overlap, or the break, between these two species ranges.

Del Norte and Siskiyou Mountains salamanders are associated with deep, rocky substrates; they are dependent on cool, moist environments. The presence of dense canopy closure may help to maintain optimum surface conditions. During periods of inhospitable environmental conditions, the salamanders retreat below the forest surface, utilizing interstitial spaces provided by deep layers of rock and talus. Management activities in the analysis area that may have affected suitable habitats for salamanders include mining, road building, rock quarry development, and timber harvest. These types of activities have affected habitats by directly disturbing rock talus or by altering the microclimate surrounding the talus substrate.

The effects of fire on plethodon salamanders are not well understood. It is expected that these salamanders are adapted to the historical fire regime of frequent low-intensity fires. Fires of this nature usually occurred during late summer and fall when it is expected that salamanders were below the surface. Fire suppression over the past several decades has probably had both positive and negative effects; accumulations of fuels, downed logs and dense canopies have increased habitat over the landscape; however, large catastrophic fires have removed habitat elements over large areas and may have eliminated isolated populations of salamanders.

#### Trends

- Populations of plethodon salamanders will continue to be identified in the analysis area through implementation of available survey protocols.
- Management and protection of known sites will assist in maintaining the viability of known and newly discovered populations.
- Knowledge of these species gained through survey and research will aid in developing management recommendations consistent with Forest management.
- Fire suppression, development of plantations, and development of previously burned areas will result in an increase of vegetation over existing rock talus, thereby creating a favorable microclimate for salamanders. Populations may increase as habitats become favorable.
- Catastrophic fire could radically change the microclimate in localized areas, causing short-term losses of isolated populations.

#### Desired Condition

- Populations within the landscape contribute to the viability of both species.
- Talus habitats are protected within the landscape, especially the older, more stable talus slopes where large, deep cobble and rock provide the best habitat.
- Forest structure associated with talus habitat is maintained to provide food sources and protection of sites from high temperatures and low humidities associated with increased exposure.
- Rock and gravel quarries for road building are developed to minimize negative effects to isolated populations of plethodon salamanders; this is done by locating quarries in areas with the least desirable characteristics (e.g., unstable areas in sedimentary rock with large amounts of fine material that may not provide habitat).

#### **Mollusks:**

Very little is known about mollusks in the analysis area. These species will be better understood and protected as more information about populations, habitat occurrence, and distribution within the Lower Scott Analysis Area are found through surveys and research.

#### Trends

- Populations of mollusks will be located in the analysis area through implementation of available survey protocols.
- Management and protection of known sites will assist in maintaining the viability of known and newly discovered populations.
- Knowledge of these species gained through survey and research will aid in developing management recommendations consistent with Forest management.

#### Desired Condition

- Populations of mollusks within the analysis area contribute to the viability of the species over their ranges.
- Forest management practices are conducted congruent with maintaining viable populations of mollusks.

**Peregrine Falcon:** Peregrine falcons are limited by suitable cliffs for nesting and snags and large trees available nearby for perches. Nesting areas on large rock outcrops have remained constant in the analysis area since historical times. Peregrine numbers have increased across their range due to protection under ESA and restrictions on pesticide use. Foraging opportunities are abundant in the analysis area, with open areas around the Scott River, riparian areas, meadows and other openings expected to be the preferred foraging areas. It is unknown what effect changes in forest structure, such as logging, burned areas, fire salvage, and road building, have had on peregrines in the analysis area. However, since peregrines are not adapted to close pursuit of prey among trees in closed canopy forests (Asay and Davis, 1984), it can be assumed that openings created by fire, timber harvest and road construction may have increased the foraging opportunities for peregrines within five or six miles of the existing nesting site at Indian Scotty.

Disturbance from humans may occur at the Indian Scotty eyrie from logging, recreational activities, wood cutting, and hunting.

#### Trends

- One peregrine eyrie will continue to be occupied in the analysis area, with increasing forage opportunities within RRs due to implementation of standards and guidelines in the Forest Plan and ACS Objectives.

- Potential habitat exists in Red Rock Creek and near Tom Martin Peak. These areas have not been surveyed and it is unknown if they provide suitable habitat for nesting peregrines.

#### Desired Conditions

- Undisturbed nesting cliffs (i.e., limited access to people, vehicles, helicopters etc.) with healthy riparian areas and vegetatively diverse areas within five or six miles of active nest sites (foraging distance).
- Reduced road access to known nest cliffs.
- Abundant large trees and snags in the vicinity of nest sites for perching.

#### **Deer:**

Black-tailed deer are a Forest Emphasis Species and a species of local concern within the analysis area. Their needs are governed by the ability to find sufficient forage to meet their energy requirements, and cover to regulate body temperature and escape predation or harassment. Deer are a popular species in this area to view and hunt. They are habitat generalists and as such use a variety of habitats within the analysis area for various aspects of their life histories. The analysis area contains winter range, transitory range, and summer range. While specific population estimates and habitat suitability are not available for the area, a CDFG draft habitat model was used to predict where high quality habitat may occur.

The areas identified as having high cover value occur at the middle elevations in the Canyon Creek Watershed (including Boulder, Kelsey, Second Valley, and Little Elk Lake Creek), upper Mill Creek, and upper Tompkins Creek. The areas identified as high forage value habitat occur in the low country along the Scott River (especially the west side), Scott Bar Mountain, upper Tompkins, and high elevation meadows in the Marble Mountain Wilderness Area.

Although no specific data exists, visual and photographic comparisons, and anecdotal information, indicate that forage quality and availability are declining in the watershed. Declines are related to lack of fire, increasing decadence of brush stands, maturation of cut over and burned areas, and conifer encroachment in high elevation meadows. According to the draft habitat model, high quality foraging habitat occupies only 11% of the analysis area in scattered areas. Much of the area identified as "high forage value" is located within previously harvested or burned areas. Extensive areas burned in 1987 are becoming unusable for foraging due to age and size of plants. Areas identified by the model as "high cover value" are good quality cover close to high value forage; therefore, with limited forage, high value cover is also

limited (12% of the analysis area). Forage quality and abundance can be improved by introducing an underburning regime in suitable forage areas relatively close to cover.

Competition for forage or cover between deer and cattle has not been documented within the watershed. Competition may occur in some areas, but the potential effects have been minimized through compliance with utilization standards and guidelines in the Forest Plan. Trends in rangelands are improving since the 1950's, when transects and plots were first installed in key grazing areas. Improvements in rangeland condition are associated with improved rangeland management by Forest personnel and allotment permittees, a gradual decrease in number of head on allotments, and with shortened grazing seasons since the early part of the century.

Roads: Road construction in the analysis area was generally done to access timber harvest units or mining claims. In addition, roads opened up areas to higher levels of human use through recreation, hunting, or collection of forest products. Human access has effects on wildlife by providing a source of disturbance, which can reduce the effectiveness of the habitat. It also provides access to once remote areas, which can cause an increase in the illegal harvest of wildlife. Use of roads and motorized trails can cause animals to move away from certain areas of heavy use. Thomas (1979) shows that both deer and elk respond negatively to increasing road density.

#### Trends

- Deer habitat within the LSRs is expected to decrease due to management of habitat for late-successional forest-related species. In the present situation, continued fire exclusion will reduce the amount of early-successional habitat created by low or moderate burning and timber harvest. Early seral habitat will be reduced unless a stand-replacing fire occurs.
- It has been suggested that local herds are declining (K. Nickell, pers. com., information from recent CDFG studies in California).
- In Matrix lands, large areas that were previously harvested or burned will be managed for later seral stages and this will reduce available forage in the analysis area. Under a continued policy of fire exclusion, early seral habitat would decrease except in areas of recent timber harvest or in the event of a stand-replacing wildfire.
- Under management direction in the Forest Plan and opportunities identified in the Forestwide LSRA and in this analysis, an ambitious prescribed fire program is proposed. In the event that this program is

adequately funded and implemented, development of early seral habitat, maintenance of shrub communities and natural meadows, and maintenance of more open stands on south and west aspects would provide a vehicle for maintaining a larger forage base for deer herds in the area.

#### Desired Condition

- Maintenance of adequate cover in late-successional forest.
- High quality forage is maintained in the analysis area through underburning.
- Matrix lands consist of 50% of capable area in mid and late-successional condition (dense or open), the other 50% is early-successional, pole, and sapling, which will provide forage for deer.
- Natural meadows and brush fields are sustained by frequent, low intensity fire.
- Transitory range and winter range on south and west aspects has open, fire-adapted conifer stands with forage below, and are maintained by frequent low intensity fire.
- Road density and associated disturbance is reduced in the analysis area.
- Roads are below an average of two mi/mi<sup>2</sup> (total road density) in LSRs. Areas in Matrix with current densities of four mi/mi<sup>2</sup> have reduced densities.

**Elk:** Elk are also a Forest Emphasis Species and a species of local concern within the analysis area. Their needs are governed by the ability to find sufficient forage to meet their energy requirements and cover to regulate body temperature and escape predation or harassment. Elk are a popular species in this area to view and hunt. They are habitat generalists and use a variety of habitats for various aspects of their life histories. Elk were hunted out of California early in this century and are now re-populating from animals released on the Happy Camp Ranger District and from herds in Horse Creek and Applegate Valley. Most of the elk use in this area is in the Marble Mountain Wilderness area and the upper portions of the Canyon Creek Landscape. Currently, elk are not hunted to any great extent in the analysis area. When elk are hunted, they become very sensitive to open roads, and high open road density can greatly reduce habitat utilization by elk.

Potential elk habitat has been identified using the draft elk habitat model. The largest patches of potential habitat were identified in upper Tompkins Creek, Scott Bar Mountain, Deep Creek, McGuffy Creek, Box Camp Mountain, and montane meadows in the Marble Mountains (Wright Lakes, Little Elk Lake, Red Rock, Sky High, Paradise Lake and Turk Lake). Cover habitat within the analysis area appears to be increasing as

plantations and burned over areas develop into mature stands. On the other hand, forage habitat appears to be decreasing as plantations and burned areas progress to later seral stages. Fire suppression has resulted in forested stands that have become denser with multi-layered stands, larger numbers of shade-tolerant species, and accumulations of ground fuels. Understory trees and shrubs have encroached into normally more open stands (e.g., south and west aspects) due to the lack of ground fires. Natural meadows are being reduced in size by encroachment of conifers, due to lack of fire.

Most detection of elk in the watershed has occurred in upper elevation meadows. Comparison of 1944 and 1995 aerial photographs shows that meadows and riparian areas in wilderness have been reduced in size through encroachment of conifers and expansion of alder stands. This assumption is supported by a study conducted in the Dillon, Clear, and Swillup Creek watersheds near Happy Camp (Skinner, 1995). Skinner found significant changes in the spatial characteristics of the openings in the landscape studied between 1944 and 1985. The primary differences between the characteristics were that the sizes of openings have decreased as distances between them have increased. Before the initiation of fire suppression activities, frequent fires were characteristic of landscapes in the vicinity of the study area. This is also true in the Lower Scott Watershed, where not only were lightning fires allowed to burn but fires were started by local residents to improve grazing conditions. The changes observed are consistent with changes that would be expected when fire is removed from a landscape where frequent, low-moderate severity fire was a common ecological process. With continued fire exclusion, and in the absence of a large stand-replacing fire, it is expected that this trend will continue. An ambitious prescribed fire program, which includes burning through high elevation meadows, would reduce encroachment on natural meadows and maintain available forage for elk in the analysis area.

#### Trends

- Although few elk have been documented in the analysis area, it is expected that numbers will increase as herds in Elk Creek and Horse Creek (adjacent watersheds) expand.
- Elk foraging habitat will decrease as plantations mature and meadows shrink by encroachment.
- Elk transitory range (forage) (i.e., south and west aspects) will become less suitable as conifers and brush continue to encroach with fire exclusion.
- In the event of catastrophic fire events, burned areas would provide new forage areas.

#### Desired Condition

- High quality forage and cover are provided in the analysis area.
- LSRs include late-successional habitat in draws, north and east aspects and RRs; south and west aspects are more open (<50% crown) with forage below.
- Matrix lands consist of 50% of capable area in mid and late-successional condition (dense or open), the other 50% is early-successional, pole, and sapling, which will provide forage for elk.
- Natural meadows and brush fields are sustained by frequent, low intensity fire.
- Transitory range and winter range on south and west aspects has open, fire-adapted conifer stands with forage below, and are maintained by frequent low intensity fire.
- Roads are below an average of two mi/mi<sup>2</sup> (total road density) in LSRs. Areas in Matrix with current densities of four mi/mi<sup>2</sup> have reduced densities.

#### **Bear:**

Suitable habitat for black bears can be characterized as forested areas with a mixture of vegetation types or seral stages providing both cover and a variety of food in good abundance. Bears occupy a wide range of habitats, with some habitats being more preferred than others. Bears tend to prefer vegetation types, such as conifer and hardwood that have a mixture of shrubs as a major component.

The vegetative diversity in the Lower Scott Analysis Area provides good habitat for bears. Management activities (such as timber harvest, road building, and fire salvage) have contributed to the diversity of the area and have assisted in maintaining foraging habitat. Areas with high open road density are less suitable due to human access, which provides a source of disturbance. It also provides access to once remote areas, which can cause an increase in the illegal harvest of bears.

#### Trends

- Denning habitat for bears, including large snags and decadent conditions, will increase in LSRs, as plantations and burned areas develop into older forest conditions.
- In Matrix lands, large areas that were previously harvested or burned will be managed for later seral stages. This may reduce available forage in the analysis area.
- Under a continued policy of fire exclusion, early seral habitat would decrease except in areas of recent timber harvest or in the event of a stand-replacing wildfire. Brush, hardwoods, and meadows may be reduced by encroachment of conifers.

- Bear are abundant in the analysis area. Although there is no specific data on population fluctuations, it is expected that numbers will remain fairly constant or may decline with a reduction in early seral conditions.

#### Desired Condition

- Conifer forests provide adequate cover and den sites for bears.
- High quality forage and vegetative diversity are maintained in the analysis area.
- Road density and associated disturbance are reduced in the analysis area.
- Bear populations are at or near their full potential in the analysis area.

#### **Turkey:**

Turkeys have been introduced on the Forest. They are fairly uncommon within the analysis area but appear to be increasing in numbers. Sightings of turkeys by local residents or Forest personnel have occurred in the town of Scott Bar (1993), in Mill Creek (1994 and 1995), on the Buker Road (1999), the mouth of Tompkins Creek (no date), Panther Cove (20 to 30 on several occasions), and on Scott Bar Mountain on many occasions (release site).

Habitat for turkeys in the analysis area includes riparian areas, oak woodlands, canyon live oak and agricultural or pasture lands along the Scott River, mouth of Tompkins Creek, Mill Creek, Scott Bar, and Scott Bar Mountain.

#### Trends:

- Turkeys are a fairly recent arrival in the analysis area. It is expected that populations will increase until available habitats are occupied.
- As turkey numbers increase it is expected that turkey hunting will increase in the area.

#### Desired Condition:

- Habitat for turkeys is maintained within the analysis area.
- Turkey populations are healthy, sustainable and huntable.

#### **Plants:**

The Lower Scott Analysis Area contains known populations and habitat for eight plant species of concern: sugar stick, California fuzzwort, clustered lady-slipper orchid, mountain lady-slipper orchid, Siskiyou fireweed, Klamath Mountain buckwheat, Siskiyou lewisia, and Salmon Mountain wakerobin.

#### Trends:

- Known populations of these species will continue to persist through time in their present abundance and distribution.
- Uncontrolled noxious weed spread and suppression of natural wildfires may contribute to declining habitat conditions for these species.
- With the exception of weed and wildfire influences, existing habitat conditions will remain unaltered to provide necessary habitat elements for known population sites.
- Additional suitable habitat will remain unaltered and available in its current condition to provide dispersal habitat for juvenile recruitment.

#### Desired condition:

- Sensitive plant populations are stable and increasing in size and distribution.
- Suitable habitats are intact and are managed to provide recruitment opportunities.
- Botanical diversity is enhanced.
- Late-successional forest associated plant populations are healthy and viable, and are not declining.

**Aspen:** Small stands of aspen can be found in high meadow ecosystems throughout the analysis area. Stands in Sky High Lakes, Red Rock and Deep Lake Creek are typical of what can be found in the area. These are some of the western-most stands in the conterminous United States.

#### Trends:

- Present trends indicate a decline in distribution and vitality of aspen.
- Heavy grazing pressure over the last 10 decades has limited the ability of clonal stands to expand in size or recruit new stems.
- Exclusion of fire in aspen ecosystems has favored conifer encroachment.
- Aspen stands are in decline throughout the western United States.

#### Desired Condition:

- Aspen stands are stable and increasing in extent.
- Aspen stands show signs of active regeneration.
- Conifer encroachment is reduced or eliminated.
- Grazing impacts are reduced.

#### **Botanical Special Interest Areas:**

There is one Botanical Special interest Area immediately adjacent to the analysis area: Lake Mountain Botanical Area.

#### Trends:

- Lake Mountain will remain the site of the northern-most population of foxtail pine in North America.

- The Lake Mountain Botanical Area will experience increasing regeneration and survival stress from white pine blister rust.
- The integrity and viability of the stand will continue to decrease due to selective disease pressures and limited opportunity for infusion of new genetic material into the foxtail pine component due to effective intra-stand isolation.
- Fire suppression will continue to favor the upslope advancement of red fir and white fir, facilitating seed dispersal into the foxtail pine zone and increasing fuel loadings.
- Habitat conditions (soils) will remain stable.
- Forest visitor use to the lookout and Special Interest Area will increase.

#### Desired Condition:

- The Special Interest Area boundary is expanded to capture the extent of Foxtail Pine on Lake Mountain.
- Natural vegetation features are maintained or enhanced to emphasize the unique plant communities of interest.
- Monitoring programs document disease and white pine population dynamics.
- Exotic pest diseases (white pine blister rust) and disease resistant tree stock specific to Lake Mountain are addressed by Forest Pest Management and Genetics.
- Human uses (grazing, recreation, fire lookout) are managed to minimize impacts to regeneration and survival of foxtail pine and associated species.
- Fuels management addresses increased fuel loadings caused by encroaching true firs.

#### **Research Natural Areas:**

Historic human use of the Marble Caves area included grazing, hunting, and fishing, followed by other recreationists and cave explorers. There has been a gradual increase in the recreational use of the area, and more people interested in the caves are now visiting, as the magnitude of the cave system becomes known Nationally. Since most of the caves have pit entrances (requiring use of vertical gear), and are exceptionally cold (38 degrees), they can be dangerous if entered by the casual tourist.

The RNA is to be managed for the "maintenance of unmodified conditions and natural ecological processes" (FSM 4063.3). Also, one goal of the RNA is to promote non-manipulative research to establish baseline or control sites for Forest management comparisons, and also form partnerships with universities and research communities. RNA standard and guideline MA1-5 directs that the Forest prepare an establishment record for the RNA. Due to the trend of increasing visitor use in the future, the

Forest will need to initiate active management of the cave system, including restricting access to some caves, issuing permits, and monitoring cave condition and cave use over time. Further details are contained in the Forest Cave Management Strategy document.

#### Trends:

- Use of cave system by recreationists will increase.
- With increased recreational use, the potential for inadvertent damage to the caves, disturbance to wildlife, or injury to unprepared tourists is likely to increase.

#### Desired Condition:

- The desired condition for the RNA is a naturally functioning cave ecosystem with little or no influence from human activities.
- This ecosystem will provide a significant contribution to the Forest's biological and physical diversity and also function as a gene pool for cave-adapted plant and animal species and as a baseline for comparing ecological changes.

#### **Exotic Species:**

Several species occur in analysis area that were introduced or that have expanded their range, such as bullfrogs, European starlings, cowbirds, and opossums. Introduced (range expanding) species compete with, or prey upon, native species. They are typically able to occupy a broader range of habitat conditions and they will continue to out-compete native species.

#### Trends:

- Population densities for exotic/expanding species are unknown within the analysis area. Species associated with human activities (such as starlings and cowbirds) will most likely remain constant, as human populations are expected to remain about the same.
- More recently introduced species, such as opossums, may increase in numbers.
- Following current trends, bullfrogs will continue to expand their range.

#### Desired Condition:

- Exotic species populations are controlled and do not present a threat to native species diversity.

## **Roads**

#### **Noxious Weeds:**

Within the Lower Scott Analysis Area, two noxious weeds are known to occur. Dyer's woad (Marlahan mustard) (*Isatis tinctorius*) and leafy spurge (*Euphorbia esula*) are located along the Scott River road. These species are rated "C" by the state of California, which requires "control or eradication as local conditions warrant, at the county level."

No formal weed control strategy has been developed on the Forest. Weed treatment has been accomplished by Siskiyou County in the past. With the issuance of the recent Invasive Species Executive Order on March 2, 1999, Federal agencies are directed to address noxious weeds in all environmental documents, and to fund and implement noxious weed control strategies.

Within the Lower Scott Analysis Area, the opportunity exists to plan control or eradication of leafy spurge and Dyer's woad. Prevention of spread of these species should also be addressed in environmental documents produced within the watersheds.

#### Trends:

- Dyer's woad and leafy spurge will continue to spread in the analysis area unless control measures are utilized.

#### Desired Condition:

- Noxious weed populations are controlled and do not present a threat to native plant diversity.

---

---

### **Key Question #1 - How have road uses changed from the past and why?**

---

---

The types of road uses have changed considerably from the past. Historically, road use centered around resource use and extraction such as mining and timber harvest. Early road construction followed old trail alignments and was constructed to provide access for fire suppression and

**Table 5 -16 Road Maintenance Budget Levels 1987-1999**

Fiscal Year	Maintenance Budget to Forest	Total Road Miles Maintained	Average Cost/Mile	Miles Maintained by Timber Sales	Timber Volume (mbf)	Budget Needed to Remain Level w/ 1987
1987	\$1,200,000	1156	\$1,038	785	238,000	-----
1992	\$968,000	1086	\$891	292	77,700	\$1,391,100
1995	\$949,000	1165	\$815	200	26,000	\$1,520,100
1997	\$1,110,000	1061	\$1,046	184	55,600	\$1,612,700
1999	\$1,140,000	1132	\$1,007	76	33,200	\$1,710,900

mining activities. Early timber harvest in the 1930-40s utilized existing roads, but as the Forest Service offered increasing numbers of timber sales in the late 1950s, new road construction was required to provide access for equipment and log transport. Road construction increased dramatically in the late 1960s through the late 1980s to provide access for the salvage logging following several large-scale fires in the analysis area. Logging continued until the early 1990s, at which time the road use related to the timber resource declined significantly in response to reduced timber harvest levels in response to T&E species issues.

There has been a slow but steady increase in recreational use of the road system, with current recreational use probably exceeding all other uses. A variety of recreational uses such as river rafting, fishing, hunting, sightseeing, trailhead access, etc. occur in multiple settings and are dispersed throughout the analysis area. Uses such as firewood, mushroom, and basketry materials collection, have created public expectations for relatively easy access to sites.

This is in direct conflict with the Forest's road maintenance budget, which has declined rapidly the last few years. In the past, timber sales were used as a means to accomplish more road maintenance and upgrade maintenance levels, supplementing road maintenance dollars. This allowed the Forest's road maintenance dollars to go further, creating a higher level of roads than the Forest could maintain.

Historically some of this Forest's road construction and/or maintenance were tied to timber sales. As a result, an extensive road system was developed to access timber resources. Timber sales prior to the 1990s maintained a good percentage of the Forest's mainline roads, thus forest maintenance funds could be spent on many of the other mainline roads, secondary and lower standard roads. Since the significant decline in timber harvest volumes in the 1990s, the Forest had to concentrate more on the mainline roads, thus secondary and low standard roads get very little maintenance.

The Forest's road maintenance budget has declined significantly since 1987 (prior to fire salvage from the 1987 fires). Although the overall road budget has remained about the same since 1987, accounting for annual inflation,

using Gross Domestic Product Price Deflators, road maintenance dollars have declined by 31% since 1987.

Several administrative road uses have probably stayed about the same, including fire suppression and law enforcement, while other uses such as silvicultural work have probably declined. Seasonal road closures have increased in the last ten years due to providing increased resource protection such as minimizing erosion in winter months, and reducing wildlife poaching and harassment.

---

### **Key Question #2 - What resource and social concerns exist with the current road system?**

---

Resource and social concerns include more immediate needs and longer-term concerns. The January 1997 flooding and the heavy rainfall for the winter 1998 have significantly impacted the existing road system. Flood damage to the road system occurred across the analysis area, but was concentrated in the Boulder, Canyon, Kelsey, Middle and Tompkins Creek areas. For further analysis discussion on hydrologic factors and roads, see "Hillslope Processes" Step 5.

The Forest survey identified 119 sites in the analysis area, which were damaged by the floods and require decommissioning or repairs. Ninety-five sites, providing critical access to private lands or administrative sites, were repaired immediately, while 24 sites are either to be repaired or decommissioned based on environmental analysis and funding. See Figure 3-18 1997/1998 Flood Damage Sites, contained in the Map Packet located at the end of this document.

Immediate concerns include repairing, improving, or decommissioning recent flood-damaged sites so they do not become sediment sources.

Long-term resource concerns (not flood related) generally involve stream sedimentation from small fill slope failures, cut bank raveling, and road surface erosion. Another resource concern involves road densities and their effect on wildlife habitat fragmentation. Stream crossings have the potential to fail, thus delivering sediment to aquatic habitats. Refer to the "Hillslope Processes" and "Terrestrial Wildlife" sections for additional discussion on road related concerns.

Social concerns about roads have been expressed at both the local and National levels.

At recent public meetings for the ecosystem analysis, local residents expressed concerns about the importance of keeping emergency access open into and out of the area by alternative routes from Scott Bar to the Klamath River via Mill Creek and then McKinney Creek, and Scott Bar to Yreka via Mill Creek and High CCC road.

Vegetation encroachment along the roadway on cut banks and ditches is a continuing safety concern. This vegetation restricts safe sight distances at road intersections or along road curves and requires periodic trimming.

Other social concerns include providing long-term access for recreational activities, mining, special forest product collection (i.e., mushrooms, basketry, etc.), firewood, fire suppression, administrative use, and maintaining a transportation system to support timber harvest activities.

At a National level in 1997, in response to concerns expressed about roads, the Chief of the Forest Service placed an 18-month moratorium on road construction in released roadless areas. The analysis area contains approximately 8,560 acres of released roadless areas. National Forests that had their plans revised by the *Northwest Forest Plan* are exempt from the moratorium. (The Klamath National Forest is exempt.) The objective of the moratorium is to provide time to develop a scientifically based and long-term Forest road policy. The Chief is quoted as saying, "We anticipate that the final long-term road policy will apply to all Forests." (To date, the final policy has not been released.)

The agency has identified three expected outcomes for the final road management policy. *First*, fewer forest roads will be build and those that are built will minimize environmental impacts. *Second*, roads that are no longer needed or that cause significant environmental damage will be removed. *Third*, roads that are most heavily used by the Public will be made safer and promote more efficient use.

The majority of the existing road system was primarily constructed to provide access for logging operations. The change in Land & Resource Management Plan land allocations has created management goals/objectives where logging is either not allowed or is not the primary land use. Portions of the current road system (maintenance levels, density, miles, etc.) are not consistent with these land allocations and have been reviewed in this process. Refer to Appendix E - Access and Travel Analysis, which documents the process used to develop road improvement, maintenance, and decommissioning opportunities. These

opportunities are preliminary and will require further site specific environmental analysis before a decision is made.

---

---

### **Key Question #3 - What are future trends in road uses, needs, and management?**

---

---

#### **TRENDS**

--A variety of recreational activities (hiking, sight-seeing, etc.) will slowly increase in use, thereby placing greater demands on the road system.

--Road maintenance budgets will probably continue to decline slightly and eventually stabilize.

--Timber harvest will continue on Matrix lands in the analysis area, placing higher and limited demands on the existing road system during harvest activity.

--There will probably be a limited amount of new road construction of National Forest system roads, primarily to support timber harvest.

--Local opposition to road closure will continue and perhaps even intensify.

--There will be an ongoing need to retain emergency alternative access routes in and out of the analysis area.

--There is increased National emphasis on improving water quality and watershed restoration through road management and stabilization.

--Without routine road maintenance, roads will continue to deteriorate.

#### **DESIRED CONDITIONS**

--A road system that meets rural access, community/public needs, resource protection, and administrative needs.

--Roads are designed, constructed, or improved to minimize resource effects and meet Aquatic Conservation Strategy Objectives.

--Use Access and Travel Analysis process and more site-specific information to manage the road system.

---



---

#### Key Question #4 - What is the recommended travel and access network?

---



---

As part of this ecosystem analysis, an Access and Travel Analysis (ATA) has been developed to make preliminary recommendations for road maintenance, improvement, and decommissioning. These recommendations are preliminary in nature, and will not be finalized until site-specific environmental analysis (NEPA) has been conducted. The ATA considers potential resource costs and the need for access for each road in the analysis area. Both of these factors are considered, and then a recommendation is made based on the type and severity of the resource impact or access need or use. Recommendations include (but are not limited to): mitigate resource concerns, improve the level of maintenance, vary the season of use, or close the road.

One of the two primary considerations of the roads assessment is to determine the human access needs of the road system. A myriad of uses of the road system occurs: recreational activities - hunting, fishing, rafting, sight-seeing, wildlife viewing, hiking; private land access; administrative access; fire suppression; timber harvest; silvicultural access for stand treatment; firewood cutting; Christmas tree/bough collection; post/poles cutting; mushroom collection; Tribal gathering of culturally important materials, mining and other uses.

To determine the human need for access in the roads assessment, all of the uses were "boiled down" into five categories: 1) Recreation, 2) Timber/Silviculture, 3) Public Access, 4) Administrative Use, and 5) Fire Access (discussed in the Terrestrial section). Definitions of the access need as high, medium, or low were then developed and are listed below in Table 5-17 Human Access Need - Definitions For Rating Roads In Access & Travel Analysis. The definitions were then applied to each road segment, and are displayed in Appendix E - Access and Travel Analysis.

**Table 5-17 Human Access Need - Definitions For Rating Roads In Access & Travel Analysis**

**Recreation (evaluate as high, medium, or low)**  
High - primary access to recreational facilities/sites identified on the 1997 Forest Visitors map. It includes campgrounds, trailheads, etc.  
Medium - primary access to known dispersed camping sites, mountain bike routes, woodcutting areas, birding routes (primarily found in Ecosystem Analyses), or trailheads not listed on the Forest Visitors Map.  
Low - any open or closed road not included above.

#### Timber/Silviculture (evaluate as high, medium, or low)

High - primary access to Matrix lands and/or multiple plantations, or areas with potential future expansion for timber sales.

Medium - secondary access to Matrix lands and/or multiple plantations, or providing access to a small area of matrix.

Low - all other roads not included above.

#### Public Access (evaluate as high, medium, or low) includes mining, Tribal gathering, firewood cutting, access to private land and/or uses (i.e. water sources)

High - known location with high use

Medium - secondary access, limited quantity or quality

Low - little or no use, no known resource value present, or a Level 1 road

#### Administrative Use includes providing access to rock pits, Forest Service Guard station, genetics site, etc.

No assigned ratings were given. Only the specific use was identified.

### Human Uses

---



---

#### Key Question #1 - How have recreation uses changed from the past and what are their trends?

---



---

Over the last five to ten years, the overall recreational use has probably been about stable. Wilderness use was inventoried in 1991 and since then significant increases or decreases in total use have not been noticed, but there has been a shift in types of uses. There has been more use by organized groups (i.e. outdoor schools, church groups, Boy Scouts), more stock use, and by people who use the Wilderness as a spiritual experience.

The surfacing of the Canyon Creek Road greatly improved access to Lovers Camp Trailhead but did not significantly increase the use. River rafting and kayaking fluctuates considerably based on spring river flows, as it always has. The number of campers at Indian Scotty Campground has increased over the last couple of years by perhaps 20% but this is probably due to improvements at the campground.

This analysis updated the Existing Visual Condition (EVC) data layer which was developed in 1989 using aerial photo interpretation (from photos dated 1985 & 1987) for the *Forest Plan*. The layer was revised to include new timber harvest activities, 1989-1999) and also to crosscheck or verify that wildfires were not miss-typed as having an affect on visual condition. Overlays of plantations and fire history were used as proxies for timber harvest and wildfire. From a visual perspective, plantations 30 years or older are considered visually recovered, and should therefore revert to an "Unnoticed" visual condition. Conversely, "new" plantations since the development of the EVC layer in 1989 would revise the layer to Drastic Disturbance. Again from a visual perspective, fire is considered a natural occurrence and therefore has no effect on visual condition --it is the fire suppression activities such as fire line construction or salvage logging (afterwards) that affects the visual condition.

**Table 5-18, Revised Acreage of Existing Visual Condition Levels**

Visual Condition Level	Forest Plan Acres 1/	Revised Acres 2/
<b>NATURAL APPEARING</b>		
Untouched	44,700	40,700
Unnoticed	6,200	5,200
<b>Subtotal</b>	<b>50,900</b>	<b>45,900</b>
<b>MODIFIED APPEARANCE</b>		
Minor Disturbance	6,000	6,200
Disturbance	10,600	13,000
Major Disturbance	3,800	5,600
Drastic Disturbance	3,400	4,000
<b>TOTAL</b>	<b>23,800</b>	<b>28,800</b>

1/ Source - *Forest Plan* data layer

2/ Revised by overlaying *Forest Plan* EVC data layer with current fire history and plantation layers.

**NOTE:** Although this information has been revised, it is still considered general in nature and requires further refinement at the project scale.

## TRENDS

--Recreational fishing has declined and will likely continue to decline with increased regulations and listing of fish. This will continue to have a negative effect on the local economy.

--Use patterns have changed somewhat from an exclusively locally dominated use to now include a Regional and National market. This is based on life-styles oriented to the outdoors, ability to travel further, and National designations such as Pacific Crest Trail, Kelsey Trail, Wilderness, and Wild & Scenic Rivers, which draw visitors from out of the area.

--There has been a slight increase in backcountry use, with use expected to continue to increase.

--Driving for pleasure, hiking, and camping have increased from past levels as a result of corresponding population increases. Their use is expected to increase.

--River rafting and kayaking use has stayed about the same.

--Hunting has always been a very popular use in the analysis area. Hunting use is expected to maintain at current levels or fluctuate slightly based on hunting regulations, herd size, and habitat conditions.

--The overall visual condition has and will continue to improve as vegetation recovers. Any decline in the visual condition will occur at a reduced rate than in the recent past because current management activities are smaller in scope and number.

## Key Question # 1a - What are the desired conditions for the recreation program?

Developed Recreation - Maintain the existing developed sites to meet the expectations of the current recreationists.

Reconstruct or improve these sites where needed to better meet safety, sanitation and setting requirements.

Remove barriers to reasonably allow access by the general public. Utilize the Forest Accessibility Action Plan.

Dispersed Recreation -

**WILDERNESS** - Manage for wilderness characteristics, natural conditions and ecological processes. Provide recreationists with a primitive and semi-primitive, non - motorized recreation opportunity. Maintain the existing trailheads and trails to meet the needs of the current users. In some cases where the trail is substandard, it may need to be reconstructed.

RIVER - Manage the Wild And Scenic river corridor to maintain its scenic quality. Provide reasonable public access to the different river segments to accommodate the current recreational uses. Maintain the existing river accesses to meet health and safety requirements and the needs of the current users.

GENERAL - Maintain reasonable road and trail access to accommodate current recreational uses outside the wilderness. Manage the scenery respective of the amount and kind of recreationist viewing.

--Increase recreation opportunities, such as hiking, fishing, driving for pleasure, etc., to meet public need/demand while providing an economic benefit to the local communities.

Visual Quality Objectives (VQO) from the *Forest Plan* provides desired visual conditions for the watershed as well as potential rehabilitation opportunities. During project development, proposed management activities are assessed as to whether or not they meet the objective identified for the area in which the project is located. See **Table 5-19 Visual Quality Objectives for the Analysis Area**, which lists the VQOs found within the watershed; also see Figure 5-2 Visual Quality Objectives, contained in the Map Packet located at the end of this document.

<b>Table 5-19 Visual Quality Objectives (VQO) for the Analysis Area</b>		
<b>VQO</b>	<b>Acreage</b>	<b>Percent</b>
Preservation	19,800	26
Retention	3,800	5
Partial Retention	46,200	63
Modification	2,600	3
Maximum Modification	2,400	3
<b>TOTAL</b>	<b>74,800 1/</b>	<b>100</b>
1/ Includes VQO acres for all NF lands.		

Past management activities have created visual impacts (Existing Visual Conditions), which sometime currently exceed the desired visual conditions (Visual Quality Objectives) identified in the *Forest Plan*. An overlay of VQOs and EVC readily identifies discrepancies and will be used in Step 6 to identify visual improvement opportunities. These opportunities are general in nature and need additional site specific review. They should be looked at on case-by-case basis when feasible to implement concurrently with other opportunities.

---

## **Key Question #2 - How does private land affect National Forest management?**

---

The checkerboard layout or arrangement of private land in the watershed can affect National Forest management. The straight property lines, which do not typically follow topographic features, create unnatural boundaries for fuels treatment.

Private land uses can affect National Forest management in various ways. Increased logging slash on private lands may increase the government's cost to treat logging slash or implement prescribed underburns on National Forest lands. Access to National Forest lands may be restricted or even denied if the only access is directly through private lands. Cooperator (COOP) roads, private easements and rights-of-way may be necessary to allow the public access.

---

## **Key Question #3 - How has community interest/involvement changed from the past and what is likely to change in the future?**

---

The local community (Scott Bar) has always had an interest in Forest management activities. This interest has increased since the late 1980s to early 1990s. National concerns over the environment have brought about changes in the use patterns of the landbase in the form of constraints and additional restrictions on its use. This has served to heighten awareness and increase sensitivity to the issues affecting the landbase that surrounds them. Local communities want to be more involved in land management decisions.

The area's primary economic dependence on Forest lands and waters from mining, logging activities, and the steelhead fishing industry has shifted to other tourist related activities (rafting, hiking, hunting) with the decline in timber harvest levels and fish populations. This shift has reduced economic opportunities for local communities.

### **TRENDS**

--The desire by the community to be involved in land management decisions will continue to rise.

--There will be an increased community interest in water quality and domestic uses.

--The general population and amount of private land in the analysis area is expected to remain the same.

## DESIRED CONDITIONS

--Diversify economic opportunities to compliment natural resource objectives.

--Maintain high quality water for domestic use.

--Develop firewood opportunities

--Forest Service works closely with local communities through partnerships, collaboration, cooperative efforts, etc.

---

---

### **Key Question #4 - How have commodity uses changed from the past and what are their trends?**

---

---

The exploration for, and development of, commodities such as gold, chromite, and timber have been the most influential factor in the development of the area: large influx and exit of people in the area, numerous communities have sprung up - some disappearing while others have grown, and a fairly extensive road system has been developed. As readily available resources were depleted, demand for resources declined, or social values changed. Today's commodity uses have declined significantly from historic levels.

Commodity uses in the past were heavy to timber harvest and mineral extraction and the use of forage for beef production. Timber harvest has reduced in intensity on public lands as land management plans have de-emphasized timber harvest as a primary commodity output. Trends in timber production will be to continue the low output of timber from National Forest lands, focusing on forest health.

Livestock grazing was much more extensive within the watershed in the past than it is today. Domestic livestock were brought to California over 150 years ago. Miners and homesteaders raised livestock to supply food for local residents. As the Scott Valley area was settled and ranches were established, cattle and sheep as well as horses, mules, goats, and swine were moved into the adjacent mountains to forage. It is estimated that almost 2000 animals were allowed to graze unregulated within the watershed compared to 350 cows and calves currently permitted. Establishment of Forest Reserves and the creation of the National Forest in 1905 brought about the first regulated use of these lands.

Livestock management objectives have shifted from an emphasis nationally on red meat production to utilizing grazing animals, as a tool to meet desired ecological conditions on rangelands. Numbers and season of use have been reduced significantly since the turn of the century when livestock grazing was largely unregulated. Animals were released from ranches in the valley and along the Scott River and they worked their way into the high meadows following the snow melt and coming back to lower elevations after the first storms of the season in the late fall. Assigned areas (grazing allotments) were established and numbers and season of use controlled when the Forest Service began to manage the Forest Reserves in the early 1900's. Numbers were further reduced in the 1940's and 1950's when vegetation and soil condition studies showed evidence of over-use and resource degradation. Ecological trends have shown steady improvement with improved livestock management practices over the last 30 years. Current studies indicate that ecological condition and trend in forage areas meet desired conditions and current numbers and season of use are appropriate (refer to Canyon Creek and Russell/Lower Scott Watershed Analyses, 1996 for issuance of livestock grazing permits on these allotments for more detailed information).

The amount of land affected by livestock use today is considerably less than in the early 1900's. Livestock numbers today are managed at an appropriate level to sustain desirable ecological conditions and meet LRMP standards and guidelines. These numbers have not changed significantly since the heavy reductions in the 1950's and 1960's. Under current management direction, rangeland conditions are satisfactory or better and meet ACS and other resource objectives. It is not anticipated that numbers will change significantly in the near future under current management direction.

Some segments of the public are opposed to livestock grazing on public lands, especially within Wilderness and there is increasing pressure to eliminate grazing for aesthetic purposes as well as concerns about potential resource impacts. Whether this attitude will prevail to a point of changing National and Forest policy regarding grazing on National Forest lands remains to be seen.

Mining has also reduced in intensity on public lands, primarily because the cost of extraction has increased and the relative price has decreased. Changes in state and federal laws and regulations have increased the complexity of mining operations to the point that they are not cost effective. Other operations, such as suction dredging, while economical and efficient are only allowed for portions of the year, thereby reducing their intensity.

The type, amount, and location of mining operations varied as resources were depleted or market conditions changed. Today gold mining occurs primarily with dredging operations found along the Scott River and several tributary streams. Mining use will probably remain near current levels. However, mining activities fluctuate with the gold market and could increase.

Overall firewood collection has declined in the last several years as the availability of easy firewood has declined in association with timber sales. Some locals have the perception that the Forest Service is not providing readily available firewood cutting opportunities (See Appendix < Public Comments.). Although some people are converting their heating source from wood to heating oil, firewood continues to be the primary heat source. There will always be people who will use wood for heat, thereby maintaining a steady need for firewood.

The overall use of boughs, Christmas trees, posts, and poles will probably remain about the same or increase slightly.

At the Forest scale, attaining the timber program outputs has become increasingly difficult since 1997. Numerous changes in management direction and fiscal allocation to the Forest have cumulatively contributed to this difficulty. A number of factors have been introduced or gained clarity in the five years of implementation since the Forest Plan was adopted in 1995. Those factors include:

- Survey & Manage Species
- Areas With Watershed Concerns
- Released Roadless Areas
- Other Discretionary Areas
- 100-Acre Late-Successional Reserves

During this analysis, District personnel were asked to take a realistic look at the current Matrix landbase and identify lands that could realistically provide timber outputs in the next ten years. Table 5-20 provides a summary of the landbase realistically available for timber outputs. A significant reduction of *Forest Plan* identified Matrix lands from 24,600 acres to 9,100 acres is expected to be available in the short-term. It should be pointed out that 24,600 are still designated in the *Forest Plan* until such time as a planning amendment formally changes the lands available. The 9,100 acres identified in the analysis are only to be used for timber planning purposes for the next decade.

**Table 5-20 *Forest Plan* and Ecosystem Analysis Comparison of Lands Available for Scheduled Timber Harvest (Matrix)**

Land Allocation or Consideration	Updated Acreage for Short-Term Timber Program	<i>Forest Plan</i> Acreage
Initial Land Base (NF lands only - excludes private lands)	74,700	74,700
Congressionally and Administratively-Withdrawn (except 100 acre LSRs & Riparian Reserves)	39,700	50,500
100 Acre Late-Successional Reserves (LSRs)	1,200	n/a
Riparian Reserves (mapped)	9,600	5,200
Lands Available for Timber Harvest <b>1/</b>	<b>24,200</b>	<b>29,800</b>
Impaired Watersheds <sup>2/</sup>	3,200	7,000
Unsuitable Ground <sup>3/</sup>	6,200	300
Released Roadless (RARE II)	2,800	n/a
Other Discretionary: low regeneration potential, visual concerns, low existing volumes, river corridor	1,800	n/a
<b>TOTAL</b>	<b>10,200</b>	<b>22,500</b>
<b>1/</b> Lands available for timber harvest include Retention, Partial Retention, Recreational River, and General Forest land allocations, collectively referred to as Matrix lands. <b>2/</b> Also called Areas With Watershed Concerns. <b>3/</b> These lands include areas mapped as water, barrens, meadows, and hardwood dominated stands.		

See Figure 6-6, which displays Short-Term Timber Outlook, contained in the Map Packet located at the end of this document for locations of matrix lands, where timber outputs may be considered. An estimated 50% of the lands mapped are occupied by survey and manage species.

As shown in Table 5-20, several factors were highlighted during this analysis that reduced the Matrix land capability to produce timber outputs during the ten-year period. These acres are still considered Matrix land allocation, but current issues and constraints make it difficult to predict

timber availability with any certainty. Listed below are the constraining factors and a discussion of how the *Forest Plan* considered them and how they were applied in this analysis for a short-term timber program (next ten years).

#### **100-Acre Late-Successional Reserves (LSRs)**

These were not identified in the 1995 *Forest Plan*. Since that time, eleven spotted owl activity centers totaling approximately 1,100 acres were identified in the watershed, on Matrix Lands. Each has been designated 100-acre late-successional reserve, and as such they are permanently unavailable for scheduled timber harvest.

#### **Riparian Reserves**

These reserves have been updated for this analysis, and thus represent a refinement of the *Forest Plan* acres that were originally mapped. The revised reserve acres (133 acres), which are unavailable for scheduled timber harvest, were removed from previously identified matrix lands. For a more detailed description of the Riparian Reserve revisions made during the ecosystem analysis process, refer to the "Riparian Areas" section Step 5. Further refinement of riparian reserves will occur at the project scale as projects are proposed.

#### **Unsuitable Lands**

These areas include lands identified as water bodies, grass, barren, meadow, or hardwood dominated stands in the vegetation data layer. Occupying 6,170 acres of matrix lands, these acres were considered to be limiting in the future.

#### **Impaired Watersheds**

The Land & Resource Management Plan identified Areas With Watershed Concerns in the analysis area. These areas are off-limits to timber harvest until such time as watershed analysis has been conducted and they are considered fully recovered. This ecosystem analysis reassessed these areas and determined that four sub-watershed areas are considered "impaired watersheds" (formerly called areas with watershed concerns) representing 3,200 acres. (See "Hillslope Processes" section Step 5.) Therefore these acres were considered to be limiting in the near future, unless specific management actions promote recovery. Future analysis determines when a watershed is no longer impaired.

#### **Released Roadless Areas**

Portions of five released roadless areas, Boulder, Box Camp, Kelsey, Muse, and Tom Martin are located in the watershed. These lands total 8,560 acres, with 4,720 acres on Matrix lands. Although these areas are legally available for timber harvest, they are currently very political. The recent announcement of the President's

Roadless Initiative requires the Forest Service to present a proposal on how to manage these lands. The Forest Service will prepare an Environmental Impact Statement (EIS) to assess effects of various alternatives; the EIS is expected to take a year to complete. Until a final decision is made, these acres are not planned for treatment in the foreseeable future.

#### **Other Discretionary Areas**

These areas were not considered in the *Forest Plan*; District personnel identified these areas as realistically not available in the short-term. These areas occupy 1,800 acres and include such areas as: river corridor, visual concerns, low regeneration potential, low existing timber volume, and mostly hardwood areas. Because of either public sensitivity to logging or economics, these areas are not considered feasible for logging in the near future.

**Salamander Habitat:** Siskiyou Mountains Salamanders are found in Matrix as well as other lands in the analysis area, and Del Norte Salamanders live in the analysis area. (See "Terrestrial Wildlife" section Step 3 for a more complete habitat description). These salamanders are a Survey and Manage species included in the Northwest *Forest Plan*, which contains provisions for maintaining habitat at 60% canopy closure; in essence making it uneconomical to log these areas. Based on local experience with past timber sales, 50% of the acres proposed for treatment have been found to have salamanders' present. Therefore 50% of the acres were considered to be limiting in the near future.

Using the updated acreage of available lands (from Table 5-20), the short-term timber yield was recalculated. The analysis method estimates 16 MMBF/decade yield for the analysis area. Using regeneration harvesting to meet Land & Resource Management Plan assumptions and desired conditions, approximately 550 acres/decade of regeneration harvest would need to occur.

**15% Old Growth Retention:** The *Forest Plan* requires that a minimum of 15% old-growth be retained in all 5th field watersheds (includes **all** land allocations). The Lower Scott analysis area is coincidental with the Canyon/Mill fifth field watershed, which makes up 97,700 acres (National Forest lands only). Of this total, 58,900 acres are considered capable lands (capable of growing 20 cubic feet of commercial wood products per acre per year). There are 33,400 acres or 57% old-growth.

There are 33,400 acres (57%) of old-growth out of 57,300 acres of capable lands, thus exceeding the minimum retention of 15% old-growth in a 5th field watershed standard (per *Forest Plan*). This allows the option of using

green tree retention as modeled in the Forest Plan as a silvicultural practice in the analysis area.

## TRENDS

The high public sensitivity to timber harvest in released roadless areas will probably continue making these lands in essence unavailable for harvest.

--The threat to plantations from large, stand-replacing wildfires is great.

--Survey and Manage species, cultural concerns, wildlife, released roadless, and unstable lands will continue to strongly influence timber project scheduling, location, and design.

--Mining activities will continue to fluctuate with market conditions and mining regulations.

--Demand for other wood products (boughs, posts, poles, etc.) will fluctuate with market and local economic conditions and may increase slightly.

--Commercial popularity of mushroom picking will fluctuate with market conditions.

## Key Questions #4a - What are the desired conditions for commodities?

--Meet public demands for commodities commensurate with resource objectives.

--Provide an even flow of timber products consistent with the Land Management Plan to help support local communities and meet National needs.

--Wildfire threats are minimized to commodity resources.

--The analysis area should be managed toward the desired mix of seral stages. Table 5-21 Existing and Desired Seral Stage Distribution lists the existing and desired mix of seral stages for the Matrix land allocations (i.e. Retention, Recreational River, Partial Retention, and General Forest).

Table 5-21 Existing and Desired Seral Stage Percentages for Available Lands for Lower Scott Watershed		
Size Class	Existing Seral Stages	Desired Seral Stages

	(%) 1/	(%) 2/
Shrub/Forb	8	5-20
Pole/Early-Mature	39	40-55
Mid-Mature	36	15-30
Late-Mature/Old- Growth	17	15-20
1/ Source - EUI vegetation layer data sort		
2/ Desired conditions are from the <i>Main Salmon Watershed Analysis (1995)</i> , assuming an even flow of timber yield, and are appropriate for use across the Forest.		

## OPPORTUNITIES

There are approximately 840 acres of plantations between 15 and 30 years of age that should be assessed for possible precommercial thinning with appropriated dollars. Plantations should be considered for thinning if they can be accomplished for no more than \$275/ac.

Regeneration harvesting should occur in older decadent late-seral stands, stands that are currently under-stocked, and mid-successional stands that have culminated. Field verification will be necessary to determine stand conditions and actual seral conditions remaining in available ground.

## Key Question #5 - What are the contemporary American Indian uses and trends and how have they changed?

Contemporary Native American uses of the analysis area are not well known. However use is generally associated with road access, and include hunting, fishing, and woodcutting. Specific conflicts with proposed land management activities will need to be addressed on a case-by-case basis, thru the environmental analysis process.

## TRENDS

--Interaction will continue between the Forest Service and the Quartz Valley Reservation.

--Traditional uses may conflict with other forest uses as more demands are placed on Federal lands.

---

---

**Key Question #5a - What are the desired conditions for the cultural resources program?**

---

---

--Opportunities between the Quartz Valley Reservation and Forest Service are enhanced through working relationships, partnerships, and agreements.

--Cultural and natural resources are identified and managed to benefit Quartz Valley Reservation members where possible.

---

---

**Key Question #6 - What are the expected proposals and needs for land adjustment?**

---

---

Most land adjustment actions are opportunity driven. There are some though that have been considered in the past that may be pursued in the future, i.e. 1) Transfer of the Scott Bar Cemetery to private ownership has long been a desire of the local public and the Forest Service. 2) Consolidation of National Forest System Lands is generally desirable to eliminate landline costs and make resource management more efficient. This was considered with Timber Products land in the past. 3) Some encroachments allow an ownership adjustment as an option. This is usually thorough a Small Tract Case. The final approval of the Wild and Scenic River Boundary cleared the way to pursue these in the river corridor. In all cases, they must be in the best interest of the public.

---

---

**Key Question #7 - What the expected special uses in the watershed?**

---

---

All of the current Special Use Permits will probably be renewed for the foreseeable future. The number of new permits is difficult to estimate because they are issued based on approval of applications submitted by the public and these are received on an occasional basis.

---

---

**Wilderness**

---

---

---

---

**Key Question #1 - Are there unacceptable impacts occurring to the physical wilderness resources from human activities?**

---

---

There appears to be an increased amount of damage occurring to some areas from camping and recreational

stock use. This mainly includes damage to standing vegetation, construction of new fire rings and camp features, denuding the ground of vegetation, and inappropriate stock holding, i.e. tying stock to trees.

Some system trails segments are in poor locations, i.e. meadows, lake shores, and/or are in poor condition causing erosion, and/or don't meet the design standard for the intended uses, i.e. stock. The Desired Condition is that all trails meet the management objectives, maximize use needs, ensure user safety, and provide resource protection for the intended user. For most system trails the intended user is recreational stock, and the rest are recreational hiker.

Because of poorly posted boundaries, there are some wilderness edges that are vulnerable to encroachment by activities that are authorized outside wilderness such as use of motorized and mechanical equipment, i.e. ATV's and bicycles. The Desired Condition is that wilderness boundaries will be posted so that encroachment by unauthorized activities is avoided.

It is apparent that unacceptable impacts are occurring from camping and associated activities such as wood gathering and stock holding, but not enough information is know as to determine the extent. The Desired Condition is that the wilderness will be managed for its wilderness characteristics and provide for both primitive and semiprimitive recreation opportunities. For this, the land will look natural with human disturbances substantially unnoticed.

The activities associated with the cave research and exploration adds to the other impacts in the area, such as camping. The Desired Condition is that a Cave Management Plan will be completed that will protect unique geology, biology and formations while providing recreational opportunities that are compatible with the wilderness character. It will identify research needs and activities that are compatible wit the wilderness characteristics.

The outfitter/guides provide services to the public, which allows some additional use to occur that wouldn't otherwise. This use creates the same type of impacts as the general recreating public and they are inventoried and analyzed in the same way. The Desired Condition is that outfitter/guides will continue to provide services to meet the needs of the public within the wilderness resource limits. These services are commercial and are part of an economic base that depends on National Forest lands.

---

---

**Key Question #2 - Are there unacceptable or negative impacts to the wilderness visitors experience?**

---

---

Many visitors to the wilderness are seeking solitude and a natural, "pristine" setting. Grazing cattle, low-flying aircraft over and adjacent to the wilderness, and disturbances from other users have been the main complaints. The Desired Condition is that as stated in the 1964 Wilderness Act, "...Wilderness will be untrammelled by man...affected primarily by the forces of nature...imprint of man's work will be substantially unnoticeable...outstanding opportunities for solitude". Authorized nonconforming uses, which impact this desired condition, need to be managed or mitigated to lessen their impacts. Activities outside wilderness that have an impact inside wilderness, i.e. noise, should also be managed to lessen their impact.

---

---

**Key Question #3 - Can fire as a natural process be restored?**

---

---

The result of fire suppression is the danger of fires burning more intensely and of longer duration and causing significant damage to the forested element of the landscape and causing unacceptable watershed damage, which would be considered unacceptable, and an unnatural consequence. The Desired Condition is to create stand conditions that are resilient to the fire regime and disturbance processes described in the historic range of variability. Ecological processes have shaped the past vegetative patterns and conditions. Besides fire, these processes include wind, flood, snow, insects, disease and landslides. It is desirable to allow these same natural ecological processes to continue in the future. By allowing the natural ecological processes to occur some landscape elements will not substantially change in patch size, shape or arrangement. Examples of such patches include barren areas, water, slide prone features, meadows, montane shrub, riparian shrub and tree complexes. These elements represent the landscapes inherent diversity and are not likely to substantially change in size. Through the effects

of fire, the condition of some elements may change. Montane shrub may be replaced by younger growth. Meadow size may change slightly and vegetation encroachment reduced. Forested elements would change in size, shape and structure, composition, or arrangement.

By allowing fire to perform as a natural process (i.e. frequent low intensity fires), there would probably be less vegetative layering or structural diversity. There would be shifts in species composition, with less shade tolerant species such as white fir and more shade intolerant species such as Douglas fir, Ponderosa Pine or Sugar Pine in mixed conifer stands. Dominant vegetation in the overstory would be more prevalent rather than multiple layers of vegetation. Multi-aged conifers and some structural layering would still be present but layering would be less uniform than what occurs today.

The shape, arrangement, and stocking of the mixed conifer stands would probably change. The seedling and pole-sized conifers would probably be small, distinct vegetative patches. The small, medium, and large-sized conifers would be a larger mosaic of combined sizes and ages with less pronounced edges. Small openings and patches of young trees would likely be interspersed among the contiguous stand canopy. Continuous recruitment from individual or small patch regeneration will occur from various natural processes, including fire, wind, insects and diseases. There would probably be less conifer stocking, within individual stands than occurs today.

Fire has significantly influenced the natural range of variability in the past and it is desirable that fire returns to play a role in creating similar vegetative patterns, as long as it does not threaten wilderness or adjacent land values. Wilderness management goals recommend that natural ecological functions should predominately shape wilderness ecosystems and that human disturbances will be substantially unnoticeable. The goal is to avoid unnatural consequences as we transition from a fire suppression mode to the reintroduction of fire as a natural process.